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SECTION I

1. DORNIER 217-E

The number of improvements found in the various types of the Do-217 appear to make this aircraft a profitable subject for further comment in view of its many diverse uses as a long range heavy bomber, minelayer, and reconnaissance airplane.

The armament of the 217-E usually consists of one 20-mm Oerlikon cannon or a 13-mm machine gun on a free mount in the nose, one 15-mm machine gun fixed in the bottom of the nose, firing forward, one 13-mm machine gun in an electrically-operated dorsal turret, a 13-mm machine gun on a free mount in the ventral position, and two 7.9-mm machine guns on free lateral mounts. In a recently crashed airplane, two sets of twin 7.9-mm machine guns were found. It is believed that they are now being used for lateral protection instead of single machine guns of the same caliber. The most recent change found in Do-217 armament is the addition of three fixed, rearward-firing guns. One is in the extreme tail and one is in the aft end of each engine nacelle. A master switch and a cocking switch are provided for the pilot and there are three firing buttons, one each for the pilot, dorsal gunner, and ventral gunner. The circuits would allow the firing of either 7.9-mm or 13-mm machine guns. It is possible that a 30-mm gun will be fitted on a few of these aircraft for use as tank-busters. The night-fighter version of the Do-217 has four 20-mm fixed cannon in the nose in addition to four 7.9-mm machine guns. It has been reported that an experimental model is now being developed which will carry eight cannon and four machine guns.

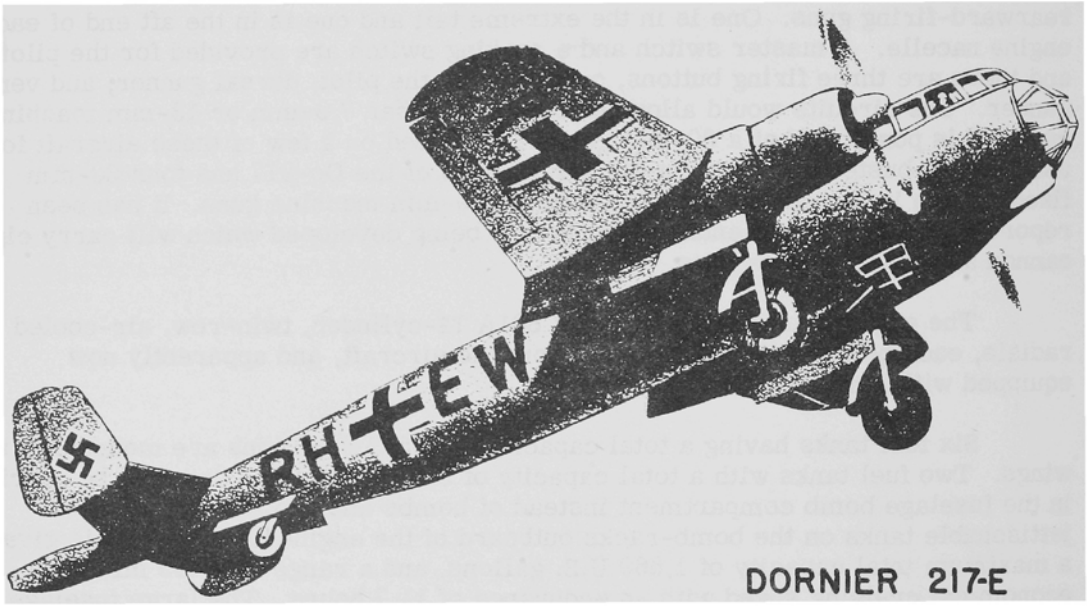
The engines are the usual BMW 801A 14-cylinder, twin-row, air-cooled radials, each being easily detachable from the aircraft, and apparently now equipped with a modified exhaust system.

Six fuel tanks having a total capacity of 785 U.S. gallons are mounted in the wings. Two fuel tanks with a total capacity of 399 U.S. gallons can also be carried in the fuselage bomb compartment instead of bombs and two 238 U.S. gallon jettisonable tanks on the bomb-racks outboard of the engine nacelles. This gives a maximum total capacity of 1,660 U.S. gallons, and a range of 2,445 miles at economical cruising speed with an endurance of 11.7 hours. The large fuselage fuel tank on the E-4 sub-type consists of a metal shell covered with self-sealing material, the first metal shell tank to be seen in a bomber.

The aircraft has a normal bomb load of 4,400 pounds, and a maximum of 6,600 pounds. Normal stowage consists of either four 1,100 pound and four 110 pound internal bombs or two 2,200 pound internal and two 550 pound external bombs. There is also provision for carrying torpedoes, but the Do-217 is not frequently used as a torpedo bomber.

The armor on the Do-217 E is reasonably comprehensive. The pilot's seat is protected by 5-mm (.197 in) plate, the back of which is attached to an 8.5-mm (.33 in) plate back-shield which moves it so that the pilot is always protected at any position of seat elevation. A piece of 9-mm (.354 in) plate in the roof of the cockpit, slightly aft of the pilot's head, gives him protection from above. For protection of the dorsal gunner, the top of the fuselage aft of the turret is armored with two

6-mm (.236 in) plates, on either side of which is a 6-mm curved triangular-shaped piece extending down over the sides of the fuselage. The rise of the turret above the fuselage is protected by a 9-mm (.354 in) circular plate made in four sections and about 12 inches high. The ventral gunner is protected in front by a 10-mm (.394 in) vertical plate, cut away for operation of the gun, and from below by 5-mm (.197 in) plates. One report states that he is also protected by an 8.5-mm (.335 in) semi-circular bulkhead 3 feet 9 inches by 1 foot 8 inches, placed aft of his position. There is no known protection for the lateral gunner. It has been reported that a 6-mm (.236 in) semi-circular bulkhead is fitted into the engine nacelles to protect the lower half of the engine and its accessories. The dinghy recess in the top of the fuselage about in line with the trailing edge of the wing, is armored with 8-mm (.315 in) rear plate, 4-mm (.157 in) plate on the sides and bottom, and 5-mm (.187 in) plate on the cover.



Some of the aircraft examined were wired and equipped for electrically operated dive-brakes, and an automatic pull-out device. The umbrella type dive-brake in the tail of early Do-217's proved unsatisfactory and the newer models have a five-slat type brake installed under the wing outboard of the engine nacelle, nearer the leading edge than the trailing edge of the wing.

In addition to the large dinghy, which is omitted in later models, each of the crew of four is provided with a single-seat dinghy, carried with their parachutes.

The F-Gerät radio altimeter, a device for measuring by radio the actual height of the aircraft above the ground, has been found in some aircraft. Usually a knife-edge cable-cutter is fitted, faired into the leading edge of the wing and around the nose.

2. GERMAN 88-MM DUAL-PURPOSE GUN

The new German antiaircraft-antitank 88-mm (3.36 in) gun (8.8-cm Flak 41) was described in some detail in Tactical and Technical Trends No. 29 p. 5 with two sketches of the gun on page 6. The following additional details are taken from a report on three damaged guns of this type that were recovered in North Africa.

* * *

a. The Gun

The barrel which has an overall length of approximately 666 centimeters (21.1 ft) or about 76 calibers, is built up in the same manner as the 88-mm Flak 36 with a securing collar at the forward end of the jacket.

The gun slides on a cradle on guideways secured to the jacket and breech ring. The breech ring is prepared to receive the various parts of the breech mechanism and the automatic rammer. On top of the breech ring is a lever secured to the end of a shaft at the outer end of which is mounted the female portion of a dog clutch. The male portion of the clutch is secured to the end of the recuperator piston rod. Underneath the breech ring is a lug for attachment to the buffer mechanism. The breech block is of the horizontal sliding block type. Additional data follows:

Height of trunnions	108 cm (42.5 in)
Maximum elevation	88°
Maximum depression	-8°
Traverse	360°

b. The Mounting

The mounting has a platform which rests squarely on the ground when in firing position. Four stabilizing pickets are provided; these are driven through prepared slots in the legs of the platform. For transport, a four-wheeled carriage is provided on which the platform is raised or lowered on a three-point lift by chain winches. The carriage appears to be identical with that of the 88-mm Flak 36.

(1) The platform consists of a longitudinal girder having a wide diamond-shaped center. At the side points of the diamond are bearings which take the two side members. These swing sideways and forwards when in travelling position. They are locked in the firing and travelling position by "D" pins. Large oblong levelling pads are mounted at the end of each of the four legs. A "T" spirit level is provided on the right side of the body just behind the traversing handwheels. In the center of the diamond is a circular base-plate on which the body pivots.

(2) The body consists of a rectangular base with two sidepieces shaped roughly like a right angled triangle with the right angle at the base at the forward

end. The side pieces are approximately 2.8 meters (9.2 ft) long and 1.2 meter (3.9 ft) high at the front. On the left sidepiece are mounted twin fuze-setting cups, lying horizontally one above the other. A seat is provided at the forward end for the fuze-setting number of the crew. On the right sidepiece at the forward end is mounted the traversing gear (two parallel handwheels with receiving dials) and an adjustable seat; at the rear end is the elevating gear (two handwheels and dials) and two adjustable seats. At the front of the body is provided a traverse travelling-clamp.

(3) The cradle is bolted on to two massive half-brackets carrying the trunnions which are mounted at the extreme rear of the body. The right trunnion supports a quadrant elevation reader arm and a sight reader arm. The buffer mechanism lies inside the cradle. The recuperator (and automatic rammer) is mounted above the piece and is attached to the cradle by means of a heavy triangular bracket at the rear, and a lighter frame, on which is set a small shield, at the front. A recoil indicator is mounted on the right hand side, reading from 700 to 1,190 mm (27.6 in to 46.9 in).

The elevating arc is secured, under the center of the cradle, to the brackets carrying the trunnions. A dial-sight carrier is mounted above the recuperator cylinder.

(4) Compensators are fitted and lie along the inside base of the side-pieces, one on each side. They are operated by large springs which are attached to the rear of the cradle by two sets of 11-strand cables.*

(5) Firing mechanism. The gun is fired electrically. A push button is secured to the right footrest of the traversing number.

(6) The shield consists of the following parts in addition to the small portion attached to the cradle. The center section is made up of two sheets of 7-mm (.27 in) metal, 1 meter (3.28 ft) in width and 1.5 meter (4.9 ft) in height, set 36 centimeters (14 in) apart on each side of the piece. Two hinged side pieces are provided, 78 centimeters (30.7 in) in width. For a depth of approximately 20 centimeters (7.8 in), the whole of the top of the shield is set back at an angle of about 30 degrees.

(7) Fuze setter. The mechanism appears to be essentially similar to that on the Flak 36 consisting of a flywheel and the electric receiving-dial and circular scale for fuze readings. The dials are set in the front of the machine so that the fuze number faces to the rear of the piece.

(8) Sights. The telescopic sight used is the Z.F.20 E6 fach 8.8/41, which differs slightly from the Z.F.20E sight used with the 88-mm Flak 36. It has the following optical characteristics:

*The source material states, "two sets of 11 cables."

[redacted]

Magnification	x6
Field of view	11°
Exit pupil diameter	4 mm
Moderating glasses	Plain glass Light neutral Dark neutral Intensely dark neutral for sun shots.

The illuminating window is at right angles to the axis of the eyepiece. The range drum is graduated every 100 meters (109 yds) from 0 to 12,100 meters (13,189 yds) being numbered every 1,000 meters (1,093 yds) from 0 to 7,000 meters (7,630 yds) and every 500 meters (545 yds) from 7,000 to 12,000 meters (13,080 yds). Other features of the sight, including the T.E. drum, are similar to the Z.F.20E sight.

ANTITANK

3. MAGNETIC AT HOLLOW CHARGE

Information recently obtained reveals that the German magnetic antitank hollow charge, Haft-Hohlladung 3 kg (6.6 lbs), is now being used in two types, one fitted with a 7-second delay igniter and the other fitted with a 4.5-second delay igniter. The latter type was described in detail in Tactical and Technical Trends, No. 23, p. 3.

The two types can be identified by the colors of the igniter-caps, the old type being painted blue while the new, 7-second type is yellow.

According to a German document on the destruction of tanks at close quarters, this charge is apparently placed on the tank; there is no mention of its being thrown.

ARMORED

4. GERMAN ARMOR AGAINST A BRIDGE

The following article, taken from a German military magazine, is of interest as emphasizing certain elementary tactical principles, which, though well known and frequently discussed, are sometimes forgotten in combat.

* * *

[redacted]

How Should Tanks Attack a Bridge?

a. First Example

(1) Situation

The Russians were withdrawing toward the north. On the previous day they had been thrown out of an improvised fortified position. A German tank battalion with attached units was ordered to pursue the enemy.

(2) Mission

The battalion was ordered to occupy the stream sector with the bridge in a village and overtake and destroy the retreating enemy.

(3) Friendly Troops

The battalion had 23 tanks -- the 1st Company, 18 -- all PzKw 3s, of which 10 were taken over from another battalion on the morning of the day of attack. They were manned by crews which had not been trained to work as a team, and the drivers did not know their tanks. The 2nd Company had only three tanks, also PzKw 3s. In addition, Battalion Headquarters had two command tanks. There was no third company. One very weak company of motorcyclists was attached, as well as two guns from an infantry cannon company.

(4) Course of Action

The battalion marched in the following order: 1st Company, Battalion Headquarters, 2nd Company, infantry cannon, motorcyclists. Some of the motorcyclists were mounted on the tanks of the 1st Company. At 1000, after taking over the new tanks, the 1st Company moved out without sending forward an advance platoon. The march was rather quiet. After moving about three miles, the head of the 1st Company reached the crest overlooking the river and saw the village with the bridge, lying in the valley below.

The leading vehicles drove straight toward the bridge at high speed, without halting to observe the terrain to their front and without giving an order or receiving one. The following tanks did the same, so that the company advanced at top speed along the road and over the crest with its entire flank exposed to the enemy. When the leading tanks, company commander, and platoon leader of the 1st Platoon were about 50 yards away, the bridge blew up. Entrenched on the opposite slope, the enemy opened fire with antitank and antiaircraft guns and artillery upon the village and the road where the company had halted. The company took cover behind the houses, each tank for itself.

By this time the rest of the battalion had reached the crest overlooking the valley and halted. The 2nd Company and the infantry guns deployed to fire on the enemy entrenched on the hill across the river, while the motorcyclists dismounted from the tanks and took cover. The commander of the motorcyclists was with the

[redacted]

battalion commander. Because the new tank crews did not know how to operate their radios, it was impossible for the battalion commander to regain control of the 1st Company and fight it as a unit. Proper coordination was absent; the new crew members did not know where they belonged. Thus the tanks of the 1st Company fought independently of each other.

Since a crossing was not possible without the bridge, the commander managed to recall the 1st Company. Under the protection of several rear tanks which opened fire one by one, each of the advanced tanks broke off separately. Three tanks of the 1st Company were knocked out in the action--two entirely and one which could be towed away. When the Russians saw that we had given up the attempt to cross, they contented themselves with harassing fire so that their own losses were fairly small.

(5) Lessons Learned

(a) When on the march, send out an advance platoon to guard against surprise, even though expecting only a weak enemy.

(b) When approaching a sector which is probably occupied, halt and reconnoiter the terrain.

(c) If it is expected to capture a bridge by advancing at full speed, then place at least some elements in the reverse-slope position to provide fire support. Do not rush into the valley with all forces, because in so doing the units may run into a trap.

(d) No attack should be made with tanks which have just been taken over from another unit. The crews do not know each other, the drivers do not know the tanks; an otherwise good company is thrown into confusion.

(e) If an attack is to be made across a stream, engineers should be on hand to build a bridge if necessary.

b. Second Example

(1) Situation

With a strong combat group the enemy had taken up a position astride the two roads leading to Armawir in the region of Dondu Kowskaja on the Laba River and had cut off and encircled a German infantry battalion.

(2) Mission

The 9th Company of the 10th Tank Regiment was assigned the mission of rescuing the infantry battalion, and capturing the bridge across the Laba.

(3) Development of Action

[redacted]

(a) Taking the Bridge

The 9th Company advanced on Dondu Kowskaja from the direction of Maikop. Shortly before reaching the bridge leaning over the Laba, it was learned that it had already been occupied by enemy antitank guns and riflemen. The 2d Platoon was immediately ordered to go into position to the right of the road in the wooded sector and to bring the bridge under fire. After the 2d Platoon had taken position, the rest of the company advanced toward the bridge at full speed and took possession of it.

The 2d Platoon was then ordered forward with one tank left at the bridge for security.

(b) Taking the Village

Communications were established with the commander of the friendly infantry battalion that was surrounded. Some of the German infantry had managed to extricate itself, and it was attached to the tank company. The tank company commander divided his force into two groups and ordered them to advance through the village in two wedge formations; the two wedges were to close in a pincers movement upon reaching the northern edge of the village. The attached infantry advanced to the right and left of the tanks with the mission of protecting the flanks and of reporting any antitank guns or rifles. The attack was successful.

(4) Lessons Learned

(a) In attacks on bridge crossings fire support should be provided and the bridge crossed at high speed to form a bridgehead.

(b) In local fighting the cooperation between tanks and riflemen must be very close. The riflemen must immediately call out to the tank crews any target and enemy movements that they see, or they must destroy them with their own weapons.

c. Conclusions

If hostile forces have had appreciable time to organize the defense of a bridge, a tank attack to capture the bridge is not likely to be successful. In the second example this was not the case; hence, the complete success. It is doubtful, however, whether success could have been achieved in the first example. In that case the enemy was entrenched on the other side of the bridge, and in considerable strength, particularly in armor-piercing weapons. The bridge was blown up by the enemy even though the leading tank platoon advanced against it at high speed.

In the first example, if the leading company had acted as did the company in the second example, it would have given the battalion commander an opportunity to reach a proper decision; as it was, he lost control of his unit.

The following mistakes were made in the first example:

(1) An advance should not be made until signal communications have been established, particularly where a unit receives replacements the same day it goes into action.

(2) On the march, security must be maintained, which was not done in this case.

(3) In open terrain, motorcyclists or armored infantry should not ride the leading tanks. In the case described, the motorcycle unit was scattered when the leading tanks ran into opposition; control of the unit was lost. In wooded country, where tanks are tied to the roads and trails through the woods, infantry may ride the leading tanks. When the leading tanks encounter the enemy, the tank "grenadiers" get off at once and fight on foot.

The situation in the first example should have been handled as follows:

(1) Before the attack, the 1st Company should have placed a platoon in a position from which it could fire on the bridge; then a second platoon should have rushed the bridge as was done in the second example.

(2) In any event, the enemy undoubtedly would have succeeded in blowing the bridge in time. The battalion commander would then have had to use his entire force for a coordinated attack. This means that the infantry guns would have had to take up firing positions, as well as most of the tanks.

(3) The next step would have been an assault by the motorcycle company.

(4) The destruction of the bridge would not necessarily have prevented the accomplishment of the mission if there had been another intact crossing in the neighborhood. Then the battalion commander would have attempted a crossing at the latter place. If no crossing were available, a bridgehead would have had to be established. The armored division would then send up engineer and infantry reinforcements to enlarge this bridgehead.

ARTILLERY

5. *RUSSIAN ARTILLERY COUNTER-PREPARATION*

The publicity which dive-bombing has received in the present war has led some to declare that "land artillery" has been superseded by the "artillery of the air". The importance which the Russians attach to artillery is indicated in the following excerpts from a translated Russian article.

* * *

[redacted]

Experience has shown that repulsing the first large scale enemy attack is repulsing the offensive in general. Counter-preparation is perhaps the decisive factor in disrupting the opponent's attack.

In preparing to repulse the German offensive on the Orel-Kursk sector, we were fully convinced that the artillery in the counter-preparation would first and foremost neutralize the enemy artillery and mortars. Certainly, troop concentrations, troop headquarters, and road-junctions should also be kept under fire. However, these problems were considered as supplemental problems. It was necessary to take into consideration the fact that in the event our artillery thoroughly neutralized the German artillery and mortars, the enemy infantry and tanks would be without fire support, and his attack would be greatly weakened. In accordance with this project, a plan of artillery counter-preparation was drawn up in the artillery units long before the beginning of the engagement. This plan was distributed to the battery commanders who prepared details pertaining to their sectors.

The positions of the enemy's artillery and mortars were placed on each battery commander's map. The commander knew that at a definite signal his battery was to fire at a specific target for a given length of time, with a definite number of rounds.

It stands to reason that this plan was flexible and that it was modified according to our knowledge of the disposition of the enemy installations. Particular care, for instance, was taken in the evaluation of the opponent's firing positions in order to distinguish between main, secondary and dummy positions.

It is not enough to prepare a detailed plan for artillery counter-preparation; it is necessary to determine the exact time of commencement. The artillery counter-preparation that is too early or too late will not give the desired effect. The commander must have exact information as to the beginning of the enemy offensive. On the Orel-Kursk sector the time was determined on the basis of reconnaissance data, confirmed by examination of prisoners of war. Based on this information the signal was given for the artillery counter-preparation.

The order in which the firing was to be carried out was as follows: To begin with, all the guns fired a five-minute preparation on the enemy batteries. The target, rate of fire and number of rounds was definitely agreed upon before hand. Immediately following this a twenty-minute concentration was placed on the same objective by a considerable part of the artillery. Finally, another five-minute concentration was fired. During this period fire was placed on assemblies of enemy infantry and tanks. Our bombers raided the enemy headquarters, communication centers and tanks. The result was that a large number of artillery batteries and observation posts were neutralized. This, of course, was reflected in the German artillery-preparation; it was light and disorganized. The activity of those German batteries which had not been destroyed was disrupted.

Despite large forces of tanks and planes, the latter of which operated against our front line in groups of 10 to 15 the Germans were unable to pierce our front,

because their artillery at the very beginning of the offensive had been neutralized and was unable to support the attacking troops.

As practice shows, it is chiefly artillery that disorganizes the defending system of fire. Because of our artillery counter-preparation, the Germans were unable in any way to disrupt our system of fire and the defenders confidently met the enemy tank and infantry. Once more it was confirmed that a fortified zone can never be breached with success with weak artillery, despite the fact that large concentrations of tanks and planes take part. Therefore, the primary object of the defending force during the first period of the battle is the neutralizing of the enemy's artillery.

The effectiveness of the artillery counter-preparation depends primarily upon how well the reconnaissance of the opponent's artillery has been carried out. On the Orel-Kursk sector our reconnaissance succeeded in correctly determining the dispositions of the enemy artillery and relaying the information in time. This gave the opportunity of modifying the plan of artillery counter-preparation so that it was most effective when finally carried out.

This successful artillery counter-preparation, compelled the enemy to modify his tactics to his disadvantage. Thus, since the German artillery and mortars had been neutralized early and thoroughly they were forced to use their bomber planes as a substitute for artillery preparation. This reduced the activity of the German air force in our rear and allowed us to maneuver with more success.

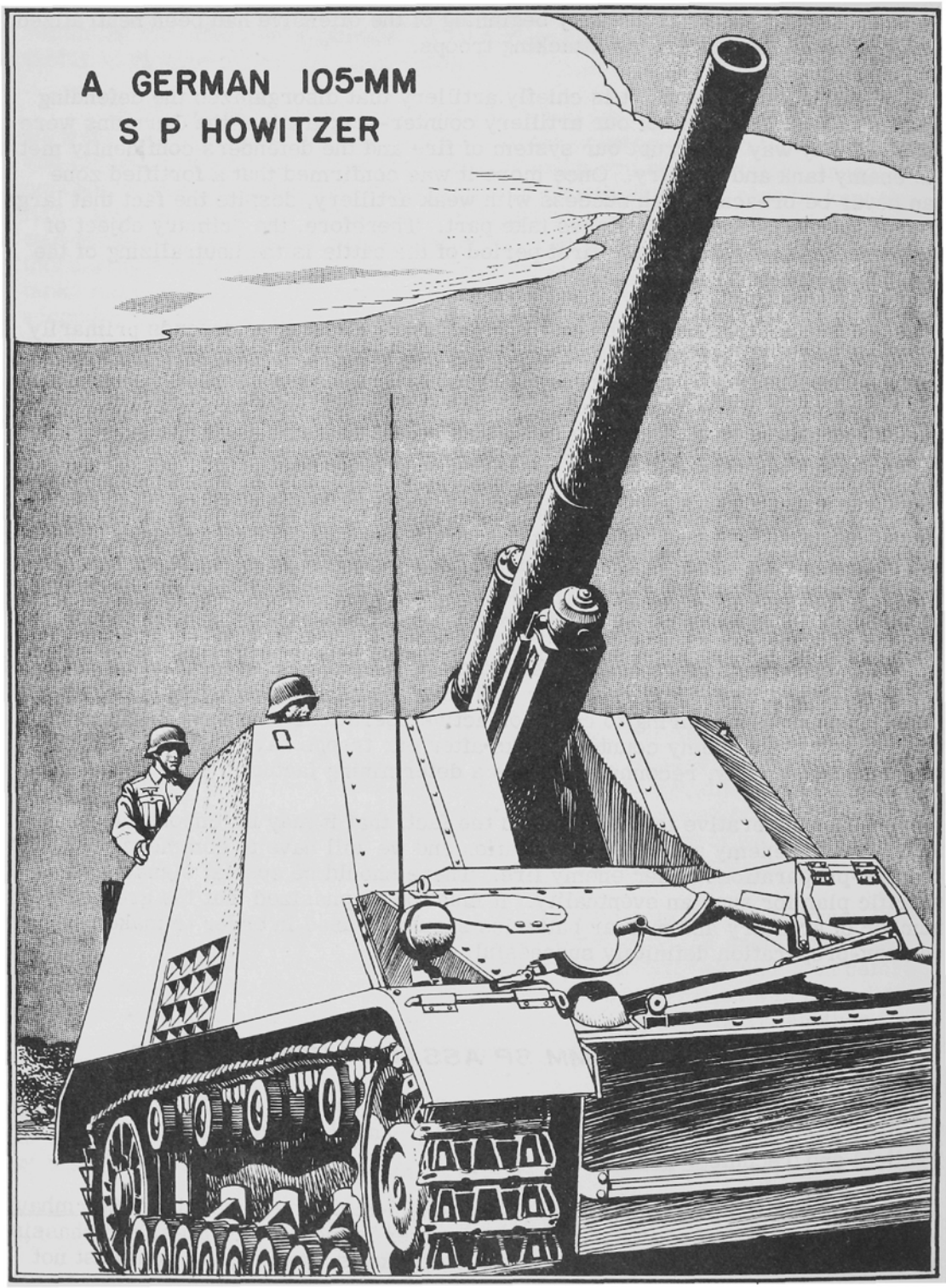
In this example we have observed the artillery counter-preparation carried out on a large scale. Small-scale or individual counter-preparation is organized if the opponent is preparing to carry on active operations on a narrow sector of the front or if the enemy counterattacks after our troops have captured certain positions. Naturally, reconnaissance is a determining factor in such a situation.

It is imperative to keep in mind the fact, that it may be impossible to anticipate the enemy artillery-preparation and we will have to commence our counter-preparations under enemy fire. There should be special signals and a specific plan for such an eventuality. It must be emphasized that the greatest number of artillery and mortar batteries should be used in order to make the counter-preparation definitely successful.

6. GERMAN 105-MM SP ASSAULT HOWITZER 42

The German 105-mm gun was described in Tactical and Technical Trends No. 12, page 12, and the 105-mm howitzers "18" and "42" were described in Tactical and Technical Trends No. 30, page 9.

Information pertaining to the German 105-mm assault howitzer (Sturmhaubitze) 42 has recently become available. This howitzer is mounted on a PzKw 3 chassis and is electrically fired. Unless the muzzle brake is attached, the gun must not


A GERMAN 105-MM
S P HOWITZER

[redacted]

be fired. Additional descriptive data follow.

Length in calibers	28
Length of barrel	9.55 ft
Length of barrel with muzzle brake	10.8 ft
Bore from breech to muzzle	8.79 ft
Maximum range	13,480 yds
Elevation	20°
Depression	6°
Width including PzKw 3 chassis	9 ft 8 1/2 in
Height including PzKw 3 chassis	6 ft 5 in
Length including PzKw 3 chassis	17 ft 8 3/4 in
Weight	21 1/2 tons
Muzzle velocity	1,771 f/s

7. CLASSIFICATION OF GERMAN ARTILLERY

It has been reported from a British source that the Germans have made the following changes in nomenclature as applied to artillery classification.

New Term	Old Term	Translation
Leichte	Leichte	Light
Mittlere	Schwere	Medium
Schwere	Schwerste	Heavy
Schwerste	Ueberschwere	Superheavy

CHEMICAL WARFARE

8. GERMAN GLASS SMOKE GRENADES

A description has recently become available of two German frangible glass smoke grenades, Blendkorper (smoke screen grenade) 1 H and 2 H.

a. Blendkorper 1 H

This munition consists of a tear-drop shaped flask, 6 inches long with a maximum diameter of 2-1/2 inches, sealed at the upper end by drawing out the flask. The sealed tip is protected by a cardboard sleeve, sealed with a plaster of Paris type material. The flask weighs 13.2 ounces with 10.6 ounces of amber-colored titanium tetrachloride, (FM).

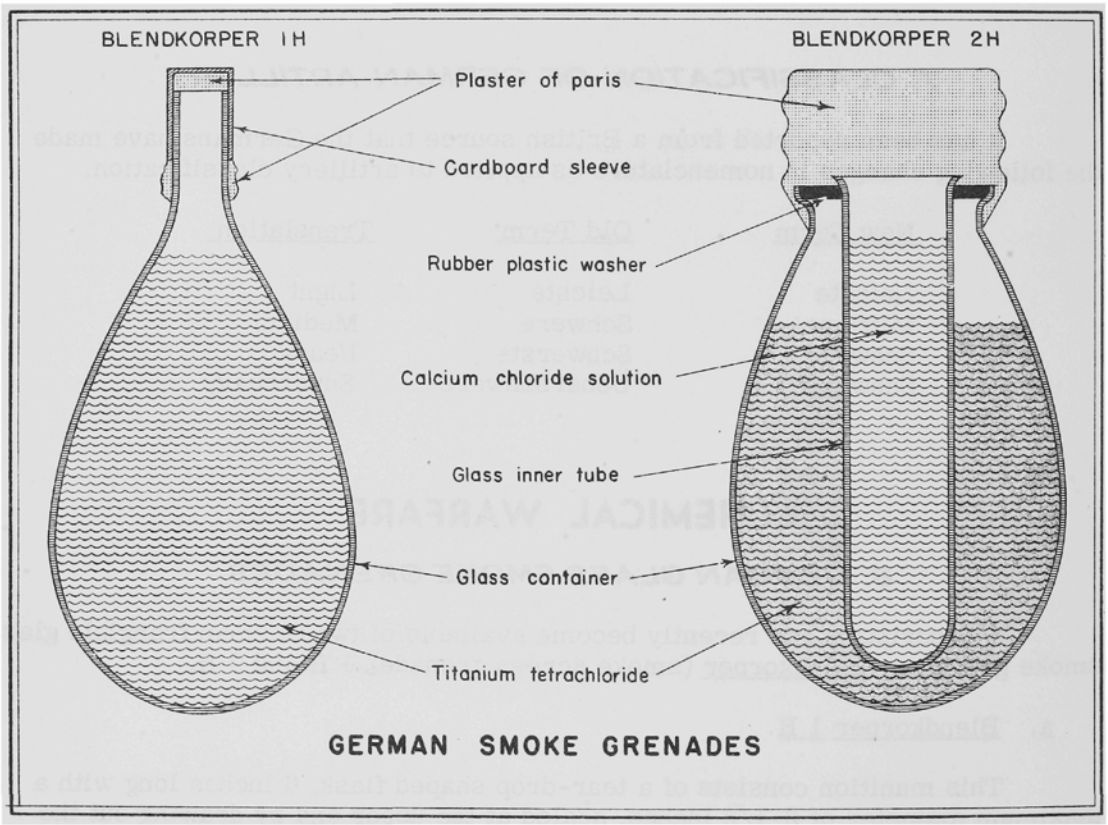
The munition is used by throwing against a hard surface which breaks the flask. The titanium tetrachloride then vaporizes, forming a smoke cloud which varies greatly with the relative humidity, being dense at a high humidity and thin at a low humidity.

[redacted]

The grenades are individually packed in a hexagonal, three-ply, corrugated paper container 6-1/2 inches long, by 3 inches square, wrapped in a transparent cellulose material. The top of the box has a handle which when pulled, removes the cover and flask. A label on the box gives in German the following directions:

Smoke Grenade 1 H
(BK 1 H)
Directions for use.

1. For carrying, leave the smoke grenade in the cardboard box.
2. For throwing, remove the smoke grenade from the box;
   draw out the cover with the smoke grenade hanging in the band;
   take the smoke grenade in the throwing hand and remove the cover.
3. Throw the smoke grenade with force at the target, peephole, sights, etc.



GERMAN SMOKE GRENADES

b. Blendkörper 2H

The grenade consists of a pear-shaped, glass outer flask, resembling a large electric light bulb, almost filled with a brown liquid. Inside is a long tube filled with a clear liquid; both are capped with a sulphur and plaster of Paris cement.

The total weight is slightly over seven ounces.*

The outer flask is a pear-shaped glass bulb, 2-1/2 inches in diameter at the widest point, 3-15/16 inches in height to the neck, where it flares out 1/8 inch and forms a collar approximately 1 inch in height and 1-1/2 inch in diameter. This flask contains 8.75 ounces of titanium tetrachloride.

The inner glass tube is 3 7/8 inches long and 7/8 inch in diameter, resembling a test tube with the upper end sealed off; the weight is a little under an ounce. The upper end has a slight shoulder which rests on a rubber-like plastic washer; this washer in turn rests on the inside shoulder of the collar of the outer flask; thus, when the cementing material was poured, the inner tube was firmly sealed within the neck of the outer flask. The inner tube contains about 1.2 ounce of a 27 per cent solution of calcium chloride.

The smoke is produced by hydrolysis of titanium tetrachloride. The purpose of the inner tube of calcium chloride solution is to provide water to react with the titanium tetrachloride and produce an instantaneous smoke cloud in the desert or in cold areas, where the low humidity would cause a slow reaction. The calcium chloride is probably added to keep the water from freezing.

This grenade was received in a cardboard box, 6-1/4 inches high, 3-3/4 inches wide, and 12-1/2 inches long, with separate compartments for each grenade; capacity four grenades. A label on the front of the box gave in German the following directions for use:

4 Screening Devices - 2H
(BK 2H)
Useable and freeze-proof to -40°C**

1. Carrying:
   Leave the Blendkörper in the closed carton.
2. Taking Out:
   Tear where indicated around the top at 1. Lift up the top, and tear out the Blendkörper. Take Blendkörper 2, 3, and 4 in the same way.
3. Throwing:
   Grasp the Blendkörper in the hollow of the hand, the round part toward the index finger. Throw with force at the target.

*Apparently, this is the weight of the container. The total of all weights given is approximately 22 ounces.
**Equivalent to 40 degrees below zero, Fahrenheit - the only point at which the two scales coincide.

[redacted]

ENGINEERS

9. ENGINEER PRACTICES IN WINTER

a. General

A German engineering training manual contains the following account of the preparation of obstacles, minefields and demolitions under winter conditions. The depths of snow in which mines become unreliable is of particular interest in view of the number of unverified reports that mines will detonate when deeply buried. The load distribution (i.e., the spreading out of the load over a greater area as the depth below the surface increases) through snow from wheeled and in particular, semi-tracked vehicles is, no doubt, appreciable. There must, therefore be a limiting depth at which a given mine may be set and still function under the desired surface load.

Thus far, there has been no evidence of electrified fences on the Russian front, but there have been unconfirmed reports of their use in western Europe.

The possibility of erecting obstacles is greatly affected by winter conditions. Deep snow forms in itself a natural obstacle; it hinders troop movements on roads and across country. Under conditions of deep snow, movement is in general limited to roads and paths which have been previously tracked, or from which the snow has been removed. For this reason particular significance is attached to obstacles on roads. Tank movements are delayed by deep snow. According to present experience, tanks can force a passage through snow up to a depth of two feet; but snow considerably reduces their capacity for climbing.

b. Natural Obstacles

Natural obstacles in winter are considerably more effective than under normal conditions. Frozen rivers can be transformed into obstacles by demolition of the ice-covering.* As obstacles they will remain effective for a length of time depending on the rate of flow and on the temperature, also on the possibility of keeping them open in the face of enemy action. Slowly moving rivers and lakes cannot be kept open. The method of demolishing the ice-cover is to blow holes in it; through these holes the main demolition charges are placed under the ice by means of poles. The effectiveness of steep banks and excavations as good antitank obstacles is increased by deep snow.

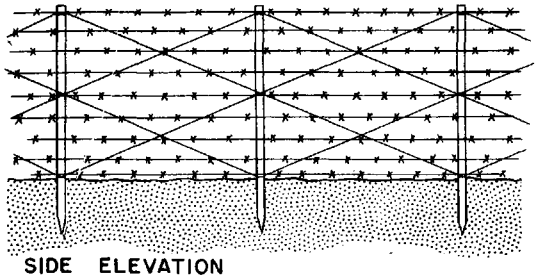
c. Artificial Obstacles

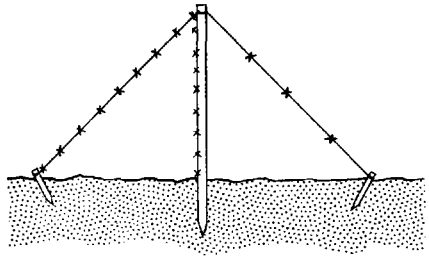
The following are artificial obstacles: wire fences, wire snares, trip wires and barbed wire rolls.

(1) Wire Obstacles

(a) Erection in frozen ground. In frozen ground iron pickets, which can be hammered in, are more practicable than wooden pickets. Sockets for pickets

*See Tactical and Technical Trends, No. 21, page 8.





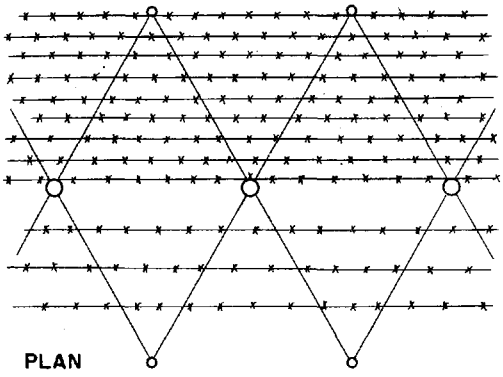


FIG. 1

HIGH WIRE FENCE FOR USE IN DEEP SNOW

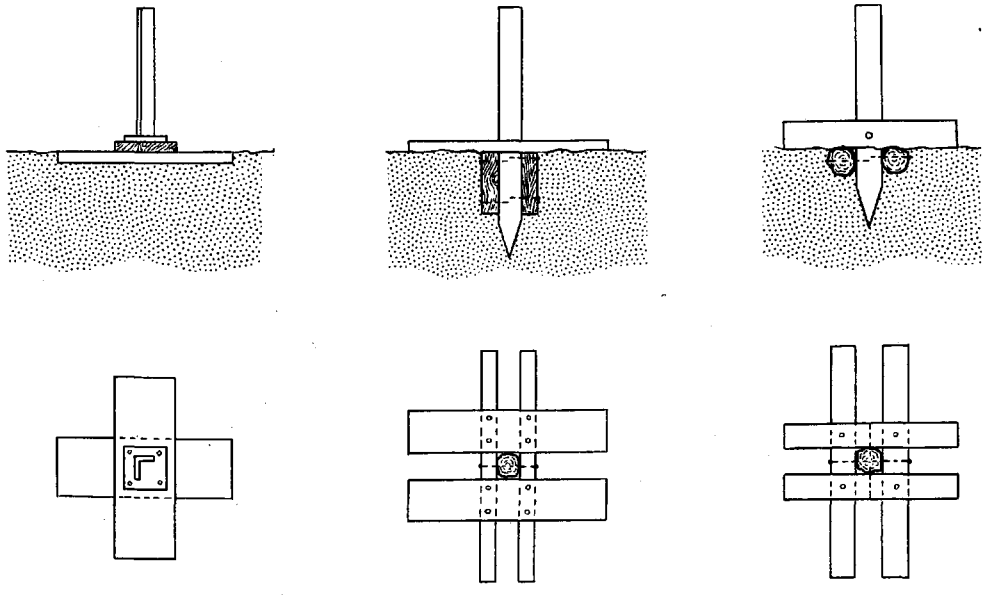
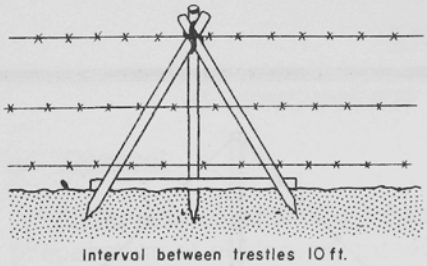
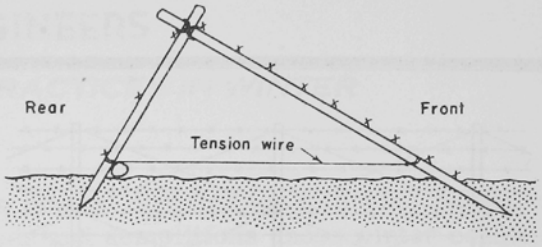


FIG. 2 ERECTION OF STEEL AND TIMBER PICKETS ON FROZEN SNOW





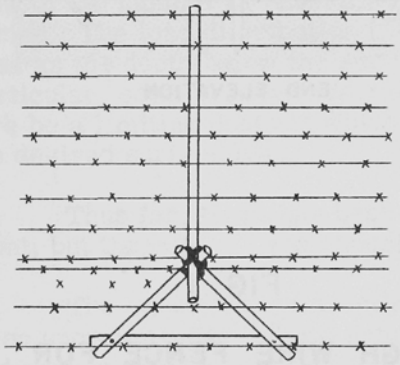
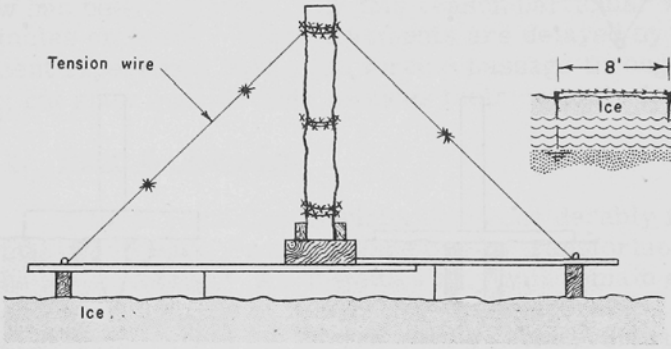
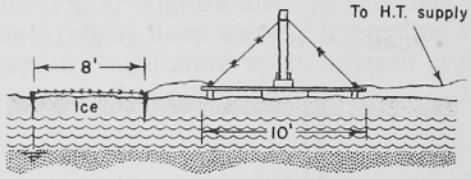


FIG. 3

TRESTLE BARBED WIRE OBSTACLE, ON SNOW





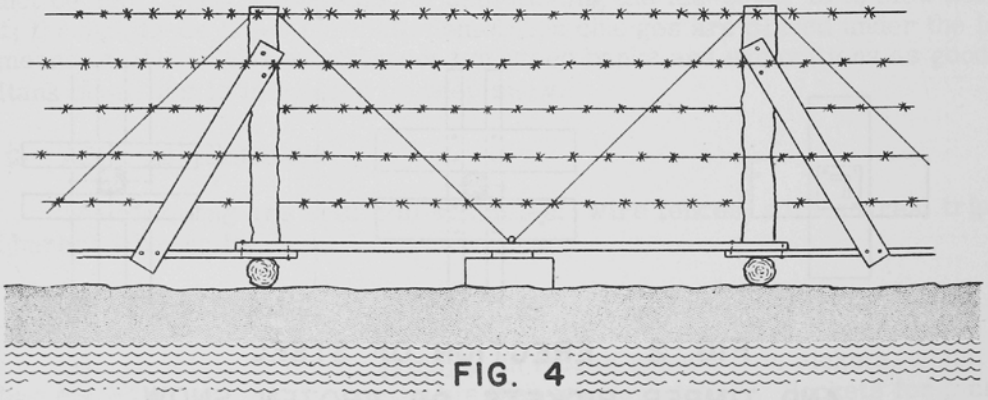


FIG. 4

ELECTRIFIED DOUBLE-APRON FENCE, ON ICE

can be prepared by engineers using power drilling equipment and demolition charges.

(b) Erection of wire obstacles in anticipation of deep snow. If deep snow conditions are to be expected, specially long pickets must be used in erecting wire obstacles. Wire can easily be set at the necessary height in woods and forests by attaching it to trees. If time is lacking, or there is uncertainty as to whether snowfall will occur, the upper strands of wire can if conditions permit be added later. A specially raised wire fence is illustrated in figure 1.

(c) Erection of wire obstacles on frozen snow. On a frozen snow surface pickets can be erected with the aid of heavy nails and cross-timbers, as shown in figure 2. Another method of erecting an obstacle on snow is shown in figure 3. Obstacles erected on snow have the disadvantage that under certain conditions they may easily sink.

(d) Simple warning devices, in the form of empty tin cans containing small stones or nails should be attached to all wire obstacles.

(e) Wire obstacles must be provided, on the side facing the enemy, with chevaux-de-trise, or rolls of plain or barbed wire.

(f) Construction of electrified wire obstacles on ice. Electrified wire obstacles can only be erected on ice by specially trained personnel. Simple wire fence, rolls of plain or barbed wire and multiple-fence obstacles in the form of several single fences, can all be constructed. Owing to the non-conducting properties of ice, a length of wire netting, eight feet in width, must be laid as a ground one foot in front of the electrified obstacle, and must be well connected to the ice by iron pickets every 30 feet. If possible, the ground should be carried right through to the river bed. Its effect can be increased by heavy snowfall. The obstacle is assembled as shown in figure 4, and erected on the ice.

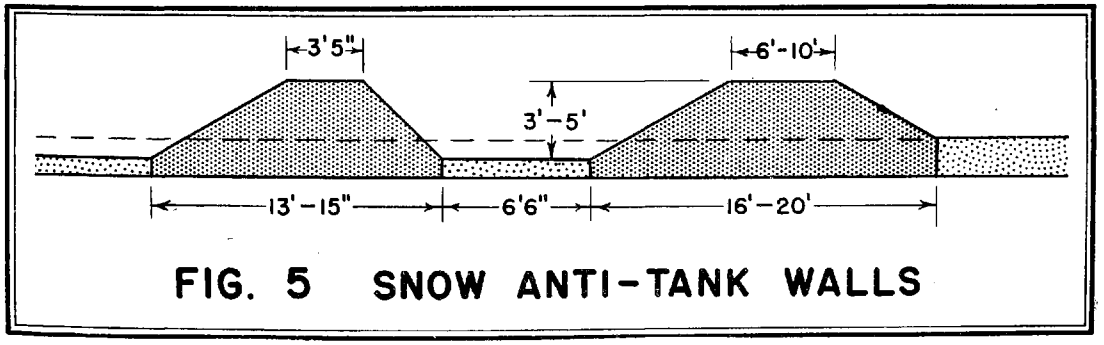


FIG. 5 SNOW ANTI-TANK WALLS

(2) Antitank Obstacles

(a) Snow as an obstacle. A continuous snow cover more than 2 feet deep forms a good obstacle against attack by tanks. The exact depth of snow which forms a complete obstacle to attack by tanks is not yet known, and snow should never be completely relied upon as an antitank obstacle.

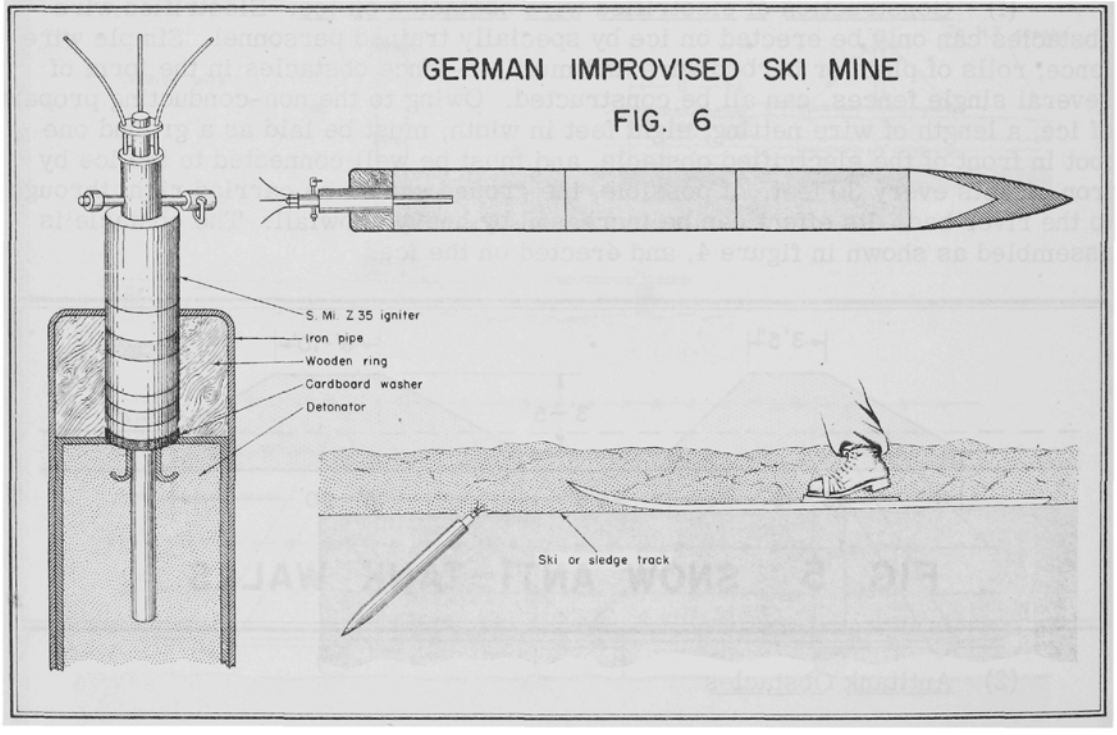
[redacted]

(b) Construction of snow walls. An effective antitank obstacle is provided by two snow walls built one behind the other, as shown in figure 5. The snow should be lightly tamped down.

(c) Artificial formation of ice. Roads can be made difficult of passage for enemy vehicles, armored cars, etc., by artificial icing. This is specially effective on steep gradients and slopes. Construction of snow walls in combination with the stretch that has been iced increases the effectiveness of the antitank obstacle. Ice-concrete obstacles, can be made -- see Tactical and Technical Trends No. 22 page 20.

(3) Minefields

The laying of minefields depends on snow conditions. Under a snow layer of one foot or more, Tellermines are no longer certain of detonation. S-mines (jumping mines) which have already been laid remain effective through frost and thaw, but are not certain of functioning under a depth of snow of four inches or more. Increasing depth of snow diminishes the capacity for detonation, and at a depth of 10 inches detonation will no longer take place. Mines of any type which have been frozen in should not be lifted, but must be demolished.



GERMAN IMPROVISED SKI MINE

FIG. 6

In the mining of ski and sledge tracks, an improvised ski-mine can be used effectively. This mine is shown at figure 6.

The fewer shelters that are available the more successfully can booby traps be used in buildings.

d. Handling of Demolition Stores

German explosives are unaffected by cold, and retain their properties through all conditions of weather and storage. In general the following precautions should be observed: -

(1) Demolition stores should be kept dry in shelters, separated from each other on wooden supports, and protected from extreme variations in temperature.

(2) Safety fuze, 1930 pattern (Zeitzündschnur 30) must be protected against cold. Safety fuze which has been frozen should be gradually warmed before use, otherwise it is liable to break.

(3) Demolition stores must be examined at frequent intervals; if in bulk, they should not be opened, but the condition of the outer layers only should be tested.

10. FIRING LOAD, TELLERMINE NO. 2

Recent British tests show that the shear-pin of the spring-loaded striker of this mine (see Tactical and Technical Trends No. 28, p. 17) shears under a dead load of approximately 400 pounds. Allowing for an impact factor of 20 per cent of the dead load, a live load of 320 pounds would be required to fire the mine.

11. CLEARING UNEXPLODED BUFFERFLY BOMBS

The following instructions for the recognition and destruction of German SD 2 "butterfly bombs," (see Tactical and Technical Trends No. 34, p. 23) has been taken from an official German directive.

* * *

a. General

The SD 2 is a fragmentation bomb weighing 4.4 pounds, whose external shape and construction differ considerably from those of the bombs formerly used.

It must be expected that some will be duds, owing to their peculiar characteristics. Duds usually detonate on the slightest movement and may therefore be dangerous to our own troops. They should be removed as soon as discovered.

[redacted]

b. Recognition

The armed SD 2 consists of a cylindrical iron body 3.15 inches long and 3.15 inches in diameter, which may be painted gray-green or black, or sometimes red, or may be unpainted. A wire cord 5.9 inches long projects from its body. There is attached to the free end of this cord a sheet-metal flap consisting of two saucer-shaped half cylinders fastened together by means of a hinge. Two smaller plate-shaped flaps are attached to this hinge, and extend to the left and right from the hinge and the saucer-shaped flaps, in an approximately horizontal direction.

SD 2 bombs which have fallen onto hard ground without exploding will, as has previously been described, be visible. Owing to their peculiar shape and construction they can easily be recognized. In order that duds may be more easily recognized, they will in the future be provided with bodies painted gray with yellow stripes .08 inch wide; which are:

(1) Parallel to the longitudinal axis on both sides of the fuze, and

(2) Painted on the nose of the bomb at an angle of 90 degrees with the foregoing stripes.

The whole surface of newly manufactured SD 2 bombs is painted yellow.

The flaps are marked as follows:

(1) The saucer-shaped and plate-shaped flaps bear yellow stripes .08 inch wide;

(2) The plate-shaped flaps bear a red stripe running at right angles to the yellow stripe.

Newly manufactured flaps are painted yellow and the plate-shaped flaps bear a red stripe .08 inch wide.

If the wire cord is torn out, as seldom happens, the bomb and flap lie in different places. It is then necessary to be especially cautious. The flaps of SD 2 bombs which have detonated are perforated by bomb fragments. If flaps not so perforated are found, it is probable that the bomb to which they belong has not detonated. The ground must be searched for bombs or be roped off to prevent any one from crossing it.

c. Sensitivity of Duds

The bomb is armed during its fall by the twisting of a pin attached to the stem-like cord from the fuze. SD 2 bombs that have not exploded are extremely sensitive. The slightest change in their position may detonate them, as the fuze is provided with a firing-pin system inside the body of the bomb, which is released by the slightest concussion. Even duds that have long been exposed to the weather retain this sensitivity. Owing to the very great fragmentation effect of the SD 2,

[redacted]

any careless act may endanger the life of the person involved, or result in seriously wounding him. It is consequently strictly forbidden to touch a dud.

d. Destruction of Duds

(1) When the bomb lies on the surface of the ground, an effort should first be made to detonate the bomb by firing a rifle-shot at it; this is usually successful owing to the concussion thus caused. In employing this method, the rifleman must fire from a safe, covered position at a distance of at least 50 meters from the dud. If the bomb cannot be exploded by firing at it, it must be destroyed by a blasting charge. When placing the blasting charge in position, one must take care not to touch the body of the bomb. It will suffice to place the blasting charge in the immediate vicinity of the dud without placing it in direct contact with the latter.

(2) When the bomb has penetrated the ground a noose of cord or wire is placed loosely around the flap without touching it. The noose is then drawn tight by a man in a safely covered position and the body of the bomb is pulled out of the ground. If it does not detonate, it must be destroyed in accordance with the instructions given under d (1).

Only artificers and personnel familiar with these instructions may destroy or remove SD 2 duds.

12. NEUTRALIZING TELLERMINE IGNITERS

In recent reports from engineers of the British Eighth Army, it is recommended that in all operational lifting of Tellermines the main igniter shall not be taken out of the mine, but instead, the slot shall be turned to Sicher (safe) and the safety bolt then pushed home. The igniter should be removed only when resistance is encountered in both of these actions.

This recommendation is based on reliable evidence and demonstrations by German prisoners of war when employed to lift their own minefields.

INFANTRY

13. BRITISH STREET FIGHTING TACTICS

The latest tactics and technique used by the British in training for combat in villages and towns indicate a rather definite consolidation of the lessons learned in the present war. Much of the procedure which is at present practiced throughout the United Kingdom is based upon intelligence coming out of Germany and Russia. Experience gained from these sources coupled with lessons learned in North Africa, should provide useful lessons for street fighting procedure.

[redacted]

In a general way, basis of present British instruction in this subject is movement covered by fire, for the most part irrespective of the apparent cover offered by buildings or other town construction. The theory of attack, which contemplates the thorough cleaning out of a particular area in a defended town, presupposes that none of the enemy can be expected to withdraw until he is driven out by the force of infantry arms. Such a theory is analogous to methods used by American troops in cleaning out areas infested by Japanese on Guadalcanal. It can be seen that the burden of the attack lies with the junior commander. Even the platoon leader is often required to make his own plans and decide upon his own sub-objectives entirely separate from those of the company commander.

The British infantryman uses a face net or veil made in a manner similar to the helmet net worn by United States troops. However, the face veil of the British soldier is sufficiently large to cover the helmet, the face and part of the shoulders. The mesh is somewhat finer than that of the helmet net. It is not attached to the helmet, but is removable and can easily be folded and carried in a pocket of the uniform. Such a veil assists in breaking the facial outline which is so easily distinguishable, especially when the wearer stands in front of a window or exposes his head above a regular skyline.

The British teach individuals who are fighting from the inside of buildings to stand back from an open window, even though this may narrow the field of fire considerably. The theory is that fighting within a town or city does not require the broader field of fire usually necessary in open country.

Where an automatic weapon is mounted to fire from within a building, a special preparation is required to prevent dust from rising from the improvised base. One method used is to spread a carpet over the base, or some other piece of compact flexible material, before setting up the weapon. A second method envisages the setting up of the tripod, followed by a thorough wetting of the surface on which the tripod rests.

When crossing streets which may be covered by enemy fire, a platoon leader requires his unit to move by squad rushes across the open area rather than to go individually. The thought here is to prevent enemy snipers from picking off members of a squad in rear of the first one or two who attempt the crossing.

The soldier is taught never to cross a street unless it is necessary for him to do so. Progress along the street should be from door to door, and at the double, keeping as near the wall as possible. In this instance, progress should be made by individuals and not by groups, since sufficient cover for only one or two men in each doorway can be expected. Should a man be hit and fall, members of his squad are instructed not to pause to effect a rescue, since the sniper causing the original casualty is almost certain to be in a position to kill anyone who pauses in the immediate vicinity.

While cleaning out the interior of large buildings, it is believed that the best procedure, where possible, is to proceed from top to bottom; it is easier to throw hand grenades downstairs or through holes made in floors of upper stories

[redacted]

than it is to attempt to throw them upstairs.

In most instances where a room is about to be entered, a hand grenade is first thrown into the room by opening the door, throwing in the grenade and closing the door quickly. The instant after the grenade has exploded, and while the results of the concussion from the explosion are still in effect, the clearing party rushes into the room with a light machine gun or rifle ready for action. The drill usually prescribes the movement from room to room or from floor to floor in two groups, evenly divided, the rear group covering the advance group by fire. For instance, at the foot of a stairway one or two men will cover the progress up the stairs of what might be called an advance searching party. After the advance group has arrived at the top of the stairs, the rear group then follows. When a room has been searched and found to be free of the enemy, the forward group calls out, "Clear". This is the signal for the covering group to enter the room. With the complete party assembled, the search is then continued from room to room and from floor to floor. The importance of searching a particularly well-defended building from top to bottom appears to be taken into special account. This naturally requires the progress from the roof top of one building to that of another. Once a particular building has been cleared, the searching party then returns to the roof, from which they move to the top of the next building, and so on.

In order to perfect this drill until it becomes a matter of second nature, the British have instituted a battle drill called Street Fighting. In this drill, a street of a town is established as a training ground and a complete infantry platoon runs the course described below:

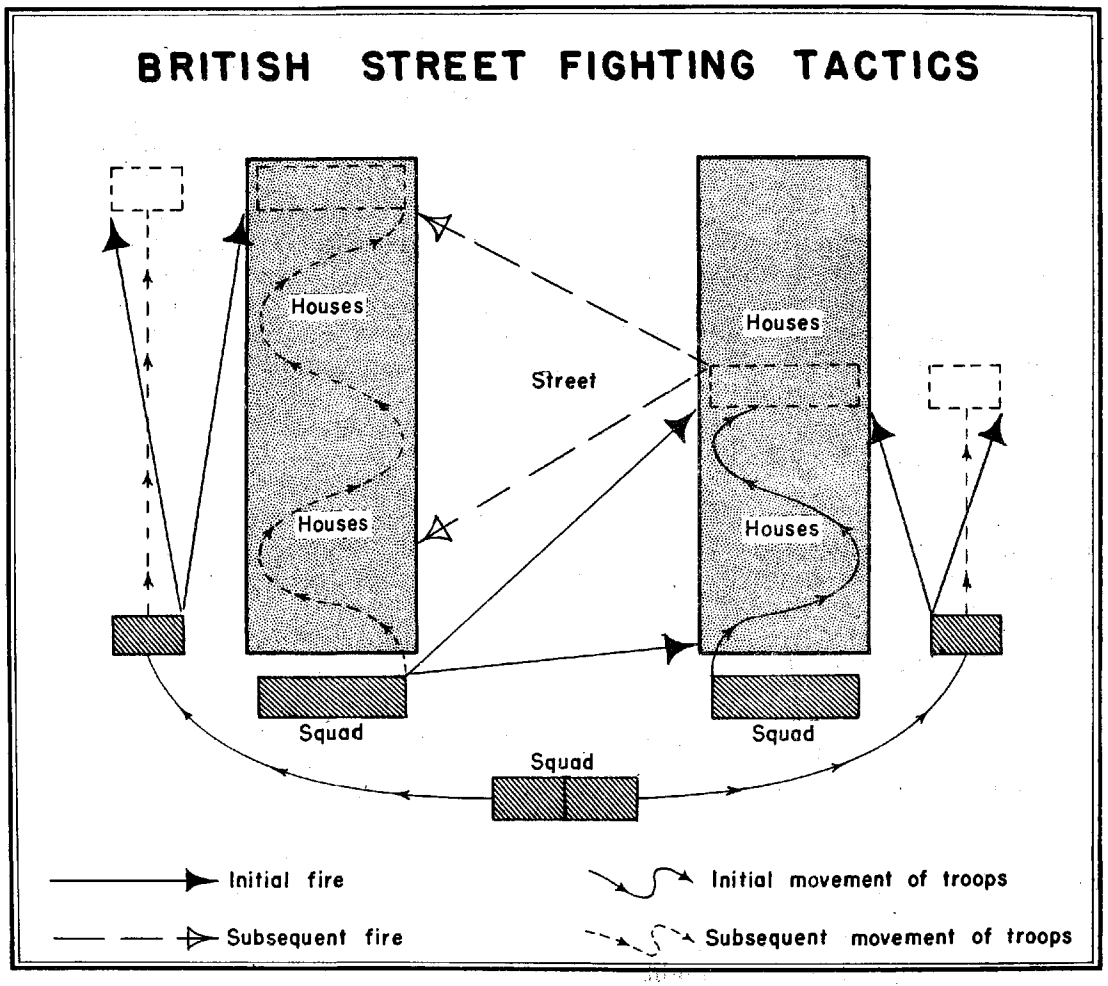
(1) The platoon divides itself into its three sections (U.S. Squads) in such a way that one section may cover the right-hand series of buildings, while another takes care of those on the left-hand side. The third section splits itself into two groups in order to cover the rear of each series of buildings which form the street. This latter section remains in firing position in the rear of the buildings until a considerable portion of the street has been cleared by the first two sections. The supporting section then advances to positions from which it may cover the rear of the buildings farther along the street.

(2) As to the action of the two sections which clear the houses paralleling the street, the section on the right side moves forward a predetermined distance, covered by fire from the left section. After the right section has reached its sub-objective, it takes up a firing position which will permit it to cover the advance of left section up its side of the street. This maneuver is then continued along the street until the entire allotted area has been cleared, see sketch.

(3) As to the progress of the individual section in its movement up one side of the street, the rifle group normally goes first, covered by the Bren-gun group. After the rifle group has reached its sub-objective, it then covers the movement of the Bren-gun group while it rejoins the section. As was described above, the entire movement of this section (squad) is covered by the fire of the

opposite section from an echeloned position.

In case the enemy fire is so intense and his resistance so stubborn as to



cause a definite pause in the progress of the platoon, the 2-inch mortar is brought into play, either for HE fire or for smoke-bomb screening purposes.

14. A GERMAN FIELD ORDER

A translation of the German field-order, "Order for the Operation Flieder-blüte" (lilac Blossom) covering an engagement in North Africa, shows a good example of German thought and care. It will be noted that while this German order has marked similarities to our own, it is much more detailed. The first two paragraphs

of the German order contain about the same amount of data that would normally be found in the same paragraphs of one of our attack orders, but instead of one instructions-paragraph with subparagraphs for each tactical unit, paragraph No. 3 of the German order merely gives the component units of the combat teams, and paragraphs 4 to 13 inclusive give the missions and boundaries of the tactical units.

ORDER

FOR THE OPERATION FLIEDERBLÜTE (LILAC BLOSSOM)

1. Enemy has withdrawn part of his forces from the right sector of the Hermann Goering Division and has disposed them in front of the 334th Infantry Division.

The reorganization of enemy forces facing our own sector, or their reinforcement by new units, is to be expected. The troops now in position will transmit information about infantry and artillery positions, as well as enemy mine fields, to the units participating in the attack.

2. Division Hermann Goering will destroy enemy forces southeast of MEDJEZ EL BAB, and enemy artillery in the area 202/49 - 45 - 56 - 63 - 59. It will engage enemy units on the right of our forces and pin them down.

In addition, the Division will capture in a night attack the chain of heights southwest of 202/49 including RAGOUBET EL HACHENE and the height near 202/66 to the road Z.P. (objective) 202/63 - 68.

3. Attacking Units

a. Battle Group (Kampfgruppe) Audorff with one grenadier battalion; one A A Battery; 1/3 Engineer Company.

b. Battle Group Schirmer with Parachute Regiment Hermann Goering; I and II Battalions Panzer Regiment 7; 1 company Panzer Pioneer Battalion, Hermann Goering; 2/3 of 4th (Antitank) Company Reconnaissance Unit Hermann Goering.

c. Battle Group Funck with parts of II Battalion Grenadier Regiment 1-Hermann Goering.

4. Missions

a. Battle Group Audorff will occupy the chain of heights southwest of 202/49 including RAGOUBET EL HACHENE; hold it along a line facing generally northwest, and block the road MEDJEZ EL BAB - GOUBELLAT against enemy tanks. Battle Group Audorff will assemble east of line 203/57-60 and attack on a line running generally from 202/47 - 203/68.

b. Battle Group Schirmer will destroy enemy artillery west of line 202/49-61, annihilate enemy forces on hill 202/66, defend itself, adjacent to Battle Group

[redacted]

Audorff on a general line 202/57-63 and on the high ground northeast of 202/68. Two subordinate units are to be formed for this operation:

Sub-unit North, consisting of:
One Jäger Battalion
11 Battalion Panzer Regiment 7
1/2 of 1 Company Panzer Pioneer Battalion Herman Goering
2/3 of Antitank Company Panzer Reconnaissance Battalion Hermann Goering

attacks from forward assembly area east of line 203/47-44 over objective 203/67 - 202/52.

Sub-unit South, consisting of:
One Jäger Battalion
1 Bn. Panzer Regiment 7
1/2 of 1 Company Panzer Pioneer Battalion Hermann Goering

attacks from forward assembly area east of line 203/65 - 223/11 over objective 223/01 - 222/09.

Battle Group Schirmer will maintain close contact with Battle Group Audorff if necessary, to support them in capturing the high ground southwest of 202/49.

Sufficient security will be provided against Lalla Manna.

c. Battle Group Funck will capture the heights along line running generally 222/27-18 and hold them to protect the left flank of Battle Group Schirmer. For this operation, Battle Group Funck will attack from the area it holds at the time across line 222/13-16 to the west and southwest.

5. Boundaries

a. Between Battle Group Audorff and Battle Group Schirmer 203/49-60 (to Audorff) - 202/53 (to Schirmer) - 52 (to Schirmer).

b. Between Battle Group Schirmer and Battle Group Funck 223/36-37-222/13-28.

6. Start of attack for all Battle Groups

X-1 day at 2300.
X day will probably be 21 April 1943.
X day will be announced definitely to the division by Major General Schmid, or the G-3 and is to be acknowledged by the Battle Group commander or adjutant.

[redacted]

7. Group of Heavy Weapons

Consisting of:
Two How batteries of 1/Pz. A.R.* 90
One battery of 88-mm AA guns
14th Co. Grenadier Regiment 1 Herman Goering

These will support sub-group "North" of the Battle Group Schirmer, and their assembly area will be 203/40-45-41.

Behind sub-group "South" of Battle Group Schirmer, will be one battery of heavy antiaircraft guns, in the area east of 223/01.

This whole group, under command of Capt. Bohme, will be kept in readiness to support on call from Division, the sub-groups of Battle Group Schirmer during the night of X day to X-1 day.

8. Unit "Hubert", consisting of two infantry companies of AA Regiment Hermann Goering will occupy during the night of X - 2 to X - 1 day, the main line of resistance in the sector 203/43 to 223/37, which at present is unoccupied.

The unit "Hubert" is subordinated to Jäger Regiment Hermann Goering, effective X - 2 day at 1200 and will be tactically under their command.

Mission: The positions of the MLR are to be defended against any tank attacks.

9. Motorcycle Battalion 10

The Battalion, only recently made available by 5 Panzer Army, will upon arrival, be attached to Regiment Audorff and will take over the present positions of Battle Group Audorff in the sector 203/71-58 on the evening of X - 1 day. Employment to be controlled through Regiment Audorff.

Mission: The positions of the MLR are to be defended against any tank attacks.

10. Artillery

Artillery Commander Hermann Goering will support with Artillery Group "North" and Artillery Group "Center", from their present assembly area, the Division attack. He will destroy, through coordinated fire, enemy artillery positions, emplacements, and assembly areas.

Closest coordination with the attacking troops is to be secured by assigning artillery liaison detachments to the battle groups, and forward observers to the

*Probably 1st Bn, 90th Artillery Regiment of the 10th Panzer Div.

[redacted]

attacking units. It is requested that the Army Artillery Commander support the Division attack with the artillery of Battle Group Audorff and the 170-mm cannon battery.

Missions:

a. For Artillery Group "North": Closest cooperation with Battle Group Schirmer, supporting their attack by destroying enemy artillery, pinning down their observation posts and shelling their positions and assembly areas.

The two light howitzer batteries designated for attachment to the heavy weapons group (Capt. Bohme), are to be kept in their positions, ready for action, as long as possible.

b. For Artillery Group "Center": To pin down the enemy in the area of 222/02 and support of Battle Funck; also by means of coordinated fire, to simulate an attack on 222/02 commencing X day, 0000 hours.

c. For Artillery of Battle Group Audorff: Support of Battle Group Audorff in closest cooperation with it.

d. For 170-mm Battery: Destruction of enemy artillery in the area south of MEDJEZ EL BAB, and the shelling of enemy observation posts and assembly areas in closest cooperation with Battle Groups Schirmer (main effort) and Audorff.

e. Special Order for the Artillery: Artillery will open fire only upon request of the battle groups, or of the observation posts attached to them, in order to insure the element of surprise.

11. Battle Plan

Based on the progress of the battle and enemy situation in general, the Division will decide on X day at 1900 hours, whether:

a. The positions gained are to be held and the heavy weapons group (Capt. Bohme) to be brought forward for this purpose into the newly-won area, reinforcing Battle Group Schirmer, or

b. Whether the mission to relieve the adjacent sector on the right, after having engaged the enemy forces there, can be considered as accomplished and the attacking units can be withdrawn to the old MLR during the night of X to X+1 Day.

The Division must, under any circumstances, avoid heavy losses in personnel and materiel.

12. Air Corps "Tunis" is requested to support the Division attack by keeping control of air over the attacking units and employing fighter-bombers to bomb known assembly areas, troop concentrations, and artillery positions; in addition, to keep surveillance over the enemy's lines of communication. The Air

[redacted]

Force liaison officer will be with Battle Group Schirmer at the start of the attack.

Particular attention is directed to Division memorandum of 15 April 1943, "Marking of Front Lines."

13. Antiaircraft Defense

With the consent of Artillery Commander Hermann Goering, the Antiaircraft Regiment Hermann Goering, with its light antiaricraft guns, will protect the artillery positions and the "heavy weapons" group.

14. Supplies

G-4 of Division Hermann Goering will secure transportation for the 50-mm antitank guns of Battle Groups Schirmer and Audorff, and fully supply the artillery in advance.

Details of the supply system will be arranged by G-4 in accordance with Special Orders.

15. Signal Communications

Division Communications Officer will set up and maintain wire and radio communication with the Grenadier Regiment, the Jäger Regiment Battle Group Audorff, the artillery commander, and the antiaricraft regiment.

Special instructions concerning signals communications will be issued separately.

16. Commander of Panzer Regiment 7 and Artillery Commander of Panzer Army 5 are requested to report to the Division CP at the start of the attack.

17. Complete secrecy of the operation Fliederblüte must be maintained, the use of ordered code names must be strictly observed. The Division forbids any troop displacements or increased vehicle traffic until the start of the attack.

18. Reports

All reports will be based on the 1:50,000 fire-control map. The attacking groups will report all noteworthy occurrences. In case of failure of signal communications, liaison officers will be dispatched.

19. Div. C.P.

Point 203/23 from X-1 day at 2200 hours.

20. I expect that all members of the Division Hermann Goering are aware of the importance of the operation Fliederblüte, and by means of their ability and moral strength, will inflict considerable damage on the British, thus contributing

[redacted]

to final victory in Tunisia.

I am convinced, that the men of the Army will share our determination and that parachutists and armored troops will fight in close cooperation as "comrades in arms".

MEDICAL

15. NOTES ON JAPANESE MEDICAL SERVICES

Information from Allied Headquarters in India indicates that the organization and general standard of Japanese medical services for the evacuation and treatment of casualties are similar to our own. The strict attention paid to precautions for the prevention of diseases likely to be contracted by troops in a theater of war shows that the Japanese do not overlook the damage which the incidence of such diseases can inflict on the morale and efficiency of an army in the field.

In addition to units of the army medical corps there are detachments of medical officers and men assigned to all regiments. These men are distributed so that there is a medical man with each platoon as well as a small medical section with the regiment. The duties of the platoon medical men include preliminary treatment of the wounded, in most cases amounting to the application of the first field dressing carried by every man, and the continuation of treatment of cases returned from hospital. It is also apparent that they are to insure that very strict prophylactic discipline is observed to counter epidemics and other avoidable diseases.

One medical orderly attached to a platoon in the Buna area, in addition to his personal belongings, carried an ordinary soldiers' knapsack containing the following:

Peptic tablets (for stomach trouble)
Aspirin tablets
Morphine solution
Tincture of iodine
Iodoform (an antiseptic)
Zinc oxide
Atabrin
Quinine sulphate
Benzoin
Knife, saw, etc., (to make a stretcher)
Adhesive plaster
Bandage
Gauze
Scissors
Thermometer
Boric acid
Rivanol solution (a disinfectant)
Syringe
Sodium bicarbonate
Absorbent cotton

In Burma malaria has been the greatest problem of the medical services. The Japanese have used mosquito nets large enough for a whole squad, antimosquito cream and spray being available for sentries and others who have to be outside

[redacted]

the net. Atabrin or quinine are also taken every day by all who have not had malaria. In spite of these precautions every man in one Japanese regiment had had malaria at least once.

Apart from malaria the Japanese have taken great care to prevent epidemics from impure drinking water. The platoon medical orderly is responsible for water hygiene and whenever the army medical authorities have not been able to lay in a supply of pure water, recourse is had to the water purification outfit (chlorinating vials) carried by every man.

In addition to anti-malaria and water precautions, pills are taken by every man however healthy, one type every ten days while five of another type containing vitamin B are taken every day, presumably to maintain general health.

Incidence of venereal disease which is low is kept to a minimum by the establishment of army organized houses, entrance to which involves first obtaining a medical certificate. However, no punishments are inflicted on those who become infected.

The Japanese are strict about inoculation and vaccination. Every time a patient is about to leave a hospital he is inoculated and battalions are inoculated en masse.

The most forward army medical unit for the treatment and evacuation of casualties is the advance dressing station of the divisional medical unit. There the patients are classified and their preliminary dressings checked. They are then evacuated by means of the ambulance company of the same unit to one of the division field hospitals. There is usually one of these with each first line regiment and they are equipped to perform reasonably extensive surgical treatment. From the division field hospitals patients are further evacuated to line of communication hospitals, reserve hospitals or base hospitals in the home areas or are released to rejoin their units. Evacuation is effected by combination of stretcher, horse-cart ambulance, motor ambulance, ambulance trains, river craft and by hospital ships.

16. GERMAN ANTI-LICE CLOTHING

From an official source comes a report that lice-killing underclothing is claimed to have been invented in Berlin. This said to be done by impregnating the clothes with a chemical substance, which by the warmth of the body develops fumes which fill all crevices in the clothing. These fumes kill the lice and keep fresh lice out. The new process is expected to be of great assistance for clothing on the Russian front. It is thought possible that the German purchase of laurel for conversion into lauric acid may provide the chemical substance alluded to, since it has been somewhat similarly used in Great Britain.

17. GERMAN RIFLE-GRENADE EQUIPMENT

The need of a high-angle weapon to fill the gap between the hand grenade and the small infantry mortar has revived the rifle grenade. In World War I, both the British and French developed rifle grenades; the British had a weapon mounted on a rod thrust down the rifle barrel and propelled by a blank cartridge; the French grenade was the "VB" of the American Expeditionary Forces. This grenade was a steel container, about the size and shape of an ordinary can of condensed milk, but pierced longitudinally with a dough-nut-like hole. When fired from a pint-size steel launcher called a "tromblon" which was fastened to the muzzle by a bayonet clip, the bullet of an ordinary ball cartridge passed through the hole in the grenade, arming it in passage, and the gases following the bullet hurled it, tumbling end over end, about 200 yards. The blast of the pound-and-a-half grenade was devastating, and a very fair measure of accuracy was obtainable with practice.

The Germans have two types of rifle grenade launchers -- one, a spigot-type launcher, similar to our own, and one, a cup-type launcher, of an entirely different sort. The cup-type launcher will fire three projectiles--an antipersonnel grenade, a light AP, and a heavy AP, both containing hollow-charges. The heavy grenade under favorable conditions will penetrate about two inches of armor, making it a rather effective antitank weapon at close quarters. Complete data is still lacking on the spigot hollow-charge grenade, but it would appear to be a powerful projectile

* * *

PART I

a. Rifle Discharger, Cup Type (Schiessbecher)

(1) The discharger (figure 1) is made of steel, and consists of a rifled barrel which screws into a holder fitted with a clamp for attaching to the rifle barrel. There are no gas ports, and varying ranges are obtained by altering the elevation of the rifle with the aid of a sighting attachment. With practice, however, the discharger can be used effectively without the sight.

(2) Ammunition

Three types of grenade (figures 2-4) are fired, two of which in different sizes are armor-piercing and the third is antipersonnel with provision for throwing as a hand grenade.

(a) Small AP Grenade (Gewehr Panzergranate G. Pz Gr)

This grenade (figure 2) incorporates the hollow charge principle, with a shaped cavity formed at the forward end of the HE filling with the result that, on impact, a jet of blast is concentrated in a forward direction. It follows, therefore, that the penetration of armor is equal at all ranges, since it depends on this jet

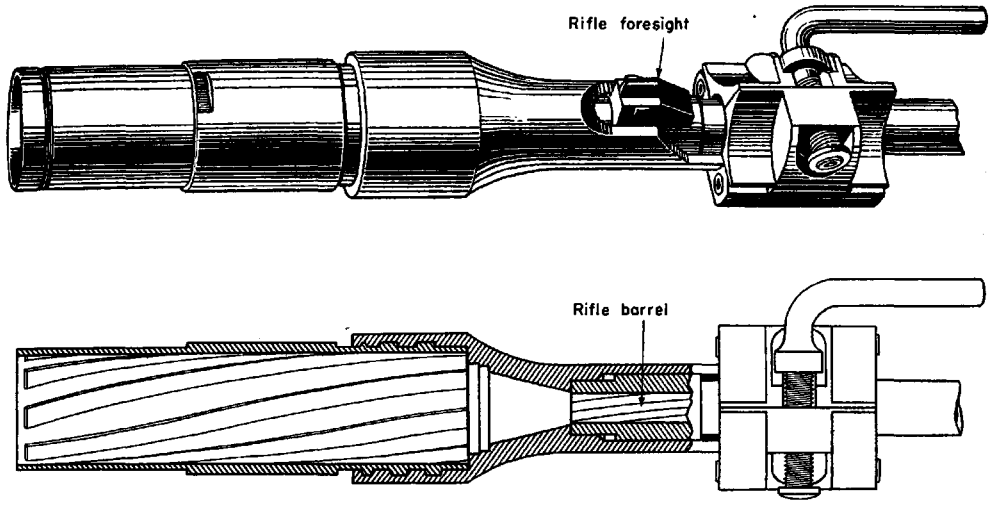


FIG. 1 RIFLE DISCHARGER (CUP TYPE)

SMALL AP GRENADE

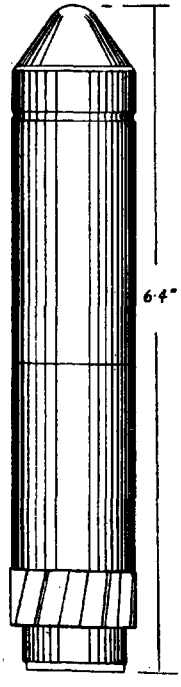


FIG 2.

LARGE AP GRENADE

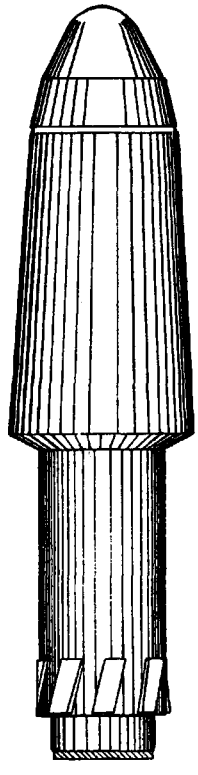


FIG. 3

ANTIPERSONNEL GRENADE

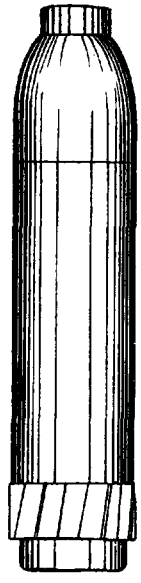


FIG. 4

[redacted]

and not on the striking velocity of the projectile. The difficulty of hitting the target, however, restricts the use of this grenade to ranges up to 100 yards. It is likely to be effective only against lightly armored targets.

The body is made in two parts -- a forward portion of steel containing the bursting charge and hollow-charge cone, closed by a light metal cap, and a rear portion of light aluminum alloy containing the fuze and detonator system. An exterior-rifled driving band is placed 6-mm (.236 in) from the rear end of the grenade. Other details are as follows:

Total weight	8.8 oz
Overall length	6.4 in
Weight of filling	1.75 oz

(b) Large AP Grenade (Gr. G. Pz Gr -- Gross Gewher Panzergrenate -- Large-weapon Panzer Grenade)

This grenade (figure 3) is constructed on similar general lines to the above, except that the front portion is enlarged and contains a greater bursting charge. The total weight of the grenade is approximately 12 3/4 ounces; the weight of the bursting charge 4 1/4 ounces. This grenade and the small AP grenade both should be handled with great care, as they arm very easily. Both of these grenades are fired by the German antitank rifle when especially modified for their use.

(c) Antipersonnel Rifle or Hand Grenade (G. Spgr Gewehr -- Sprenggranate)

The cylindrical steel body of the grenade contains the HE filling and detonator. It is screw-threaded at the nose to take the fuze-body and at the base to take the rifled base-attachment. When fired from the discharger, the grenade functions on impact, or after 11 seconds, by means of a self-destroying system should the fuze fail to function. When thrown by hand, the base-attachment is unscrewed and removed, giving access to a cord attached to a friction igniter. Immediately before throwing, the cord is pulled and the grenade detonates after 4 1/2 seconds delay. Other details are as follows: --

Overall length	5.5 in
Weight fuzed	9 oz
Weight of filling	1.1 oz
Maximum range	250 yds

(d) Propelling Cartridge

In the case of the small AP grenade and the antipersonnel grenade, the propelling charge is a standard 7.92-mm steel cartridge case closed at the mouth by crimping. For the large AP grenade the cartridge is provided with a wooden bullet. The grenades are packed singly in cartons with their appropriate cartridges.

(e) The sight (figure 5) is in two parts; a fixed portion consisting of a carrier-plate and clamping band, and a moveable portion comprising a sight arm

with rearsight, frontsight, and bubble level, and a range arc. The range arc has two scales; the upper, for low-angle fire, is graduated from 0 to 250 meters, and the lower, for high angle fire, from 50 to 250 meters (1 meter=1.1 yards approx).

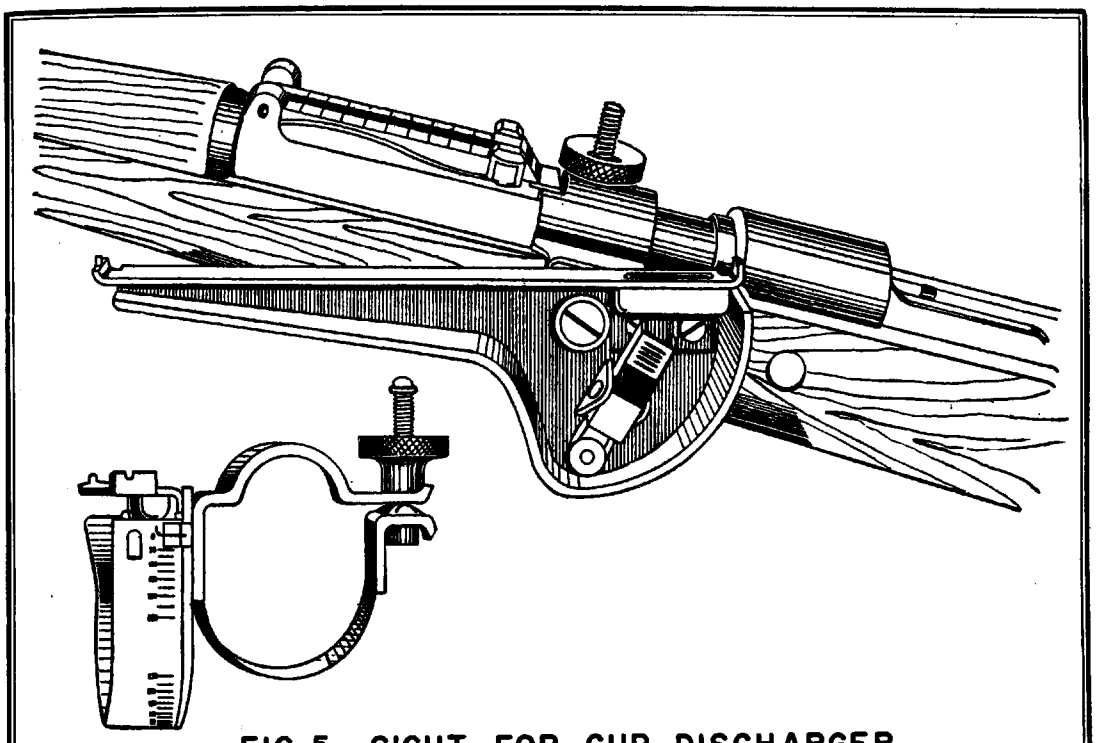


FIG. 5 SIGHT FOR CUP DISCHARGER

The sight is attached to the left side of the rifle by means of the clamping band, immediately to the rear of the rifle rearsight. The data on the range scale apply only to the antipersonnel grenade. For the two AP grenades the following corrections should be made: --

Small AP grenade

75 meter graduation corresponds to 100 meters (109 yards) required range.
50 meter graduation corresponds to 65 meters (75 yards) required range.

Large AP grenade

125 meter graduation corresponds to 100 meters (109 yards) required range.

100 meter graduation corresponds to 75 meters (82 yards) required range.

75 meter graduation corresponds to 50 meters (55 yards) required range.

PART II

a. Rifle Discharger, Spigot Type

(1) Discharger

The discharger consists of a hollow tubular spigot (see figures 6 - 7) of about one inch diameter terminating in a part resembling the hilt of a bayonet. Over this spigot fits the hollow tail-piece of the grenade. It is fitted to the rifle, in the same manner as a bayonet, over the bayonet standard and foresight block, and is locked in position by a spring-loaded bolt. On firing the propelling cartridge, the gasses pass out of the barrel of the rifle, through the spigot, and into the hollow tail-piece to propel the grenade.

(2) Sights

(a) A swing-over blade front sight is fitted to the left side of the base of the spigot.

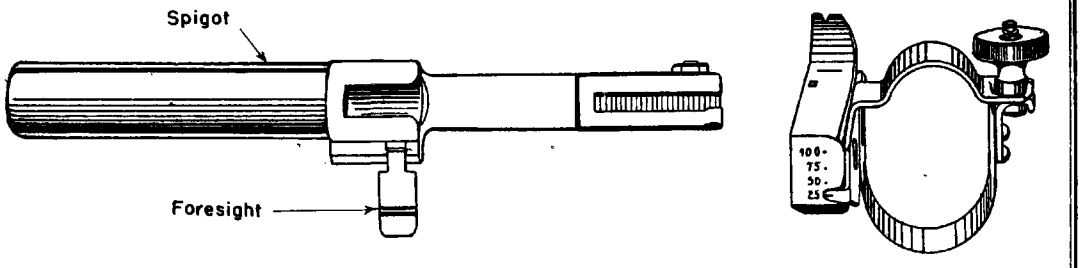


FIG. 6 RIFLE DISCHARGER (SPIGOT TYPE) AND SIGHT

(b) A rear sight attachment is fitted to the left side of the rifle by means of a metal strap and thumbscrew. The body, which is movably attached to the metal strap by means of a carrier-plate, is in the form of a metal box about five inches in length, on the forward end of which a V is formed. The other end, facing the firer when the sight is assembled to the rifle, is inscribed with a range-scale graduated from 25-100 meters in steps of 25 meters. To give the desired range, the body is rotated and the appropriate graduation brought opposite a pointer on the carrier plate. The body is then held in position by a ball and spring detent.

(c) Ammunition

Only one type of ammunition has been identified to date. This is a hollow

charge antitank grenade with a tubular tail which fits over the spigot of the discharger, see figure 7. The grenade is grey-green in color. The head is bell-shaped and contains the explosive filling, which is hollowed out to a depth of .79 inch and contained by a concave aluminum diaphragm. The head is closed by a slightly convex metal cap.

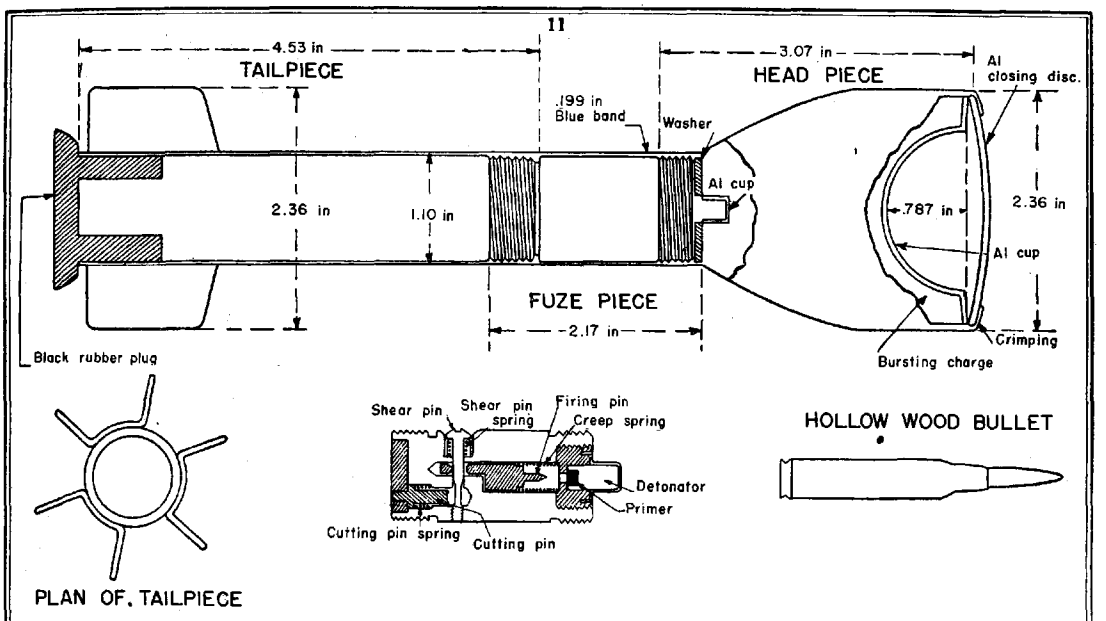


FIG. 7 GRENADE FOR SPIGOT TYPE DISCHARGER

The fuze body, which is cylindrical, screws into the base of the head. On firing, pressure acts on a cutting pin, the base of which is flush with the base of the fuze. This shears a safety pin which is ejected by a spring. The firing pin can then set forward on impact into the detonator. The tail screws into the base of the fuze. It is tubular and has six tail fins near the base. The grenade is propelled by means of a wooden-bullet blank cartridge. Until needed, this cartridge is carried in the tail tube of the grenade which is closed by a rubber plug.

18. JAPANESE 250-KG HE AND INCENDIARY BOMB

The high-explosive, incendiary bomb is one of the most effective instruments for the crippling and destruction of military and economic objectives. The following details and diagrams relative to the Japanese 250-kg high-explosive and incendiary bomb are based on a field report made by trained bomb disposal officers in New Guinea.

[redacted]

* *

a. Details

Overall length	9 ft 9 in
Diameter of body	12 in
Wall thickness	7/32 in
Total weight	550 lb (approx)
Main filling	HE, and 750 (approx) incendiary cylinders.
Color	Light grey
Markings	Red band on tail. 6 in silver band on end of nose.

b. Use

Due to "Air bursts", and propulsion by the HE charge, incendiary cylinders are showered over a comparatively large area. Likely targets would be grounded airplanes, airfield installations, munition and supply dumps, and buildings.

The known radius of action of the incendiary cylinders is 176 yards.

c. Description

The body is made up in three separate parts -- the barrel, a cast steel nose, and a conical-shaped tail-unit.

(1) There are ten layers of incendiary cylinders in the barrel, stacked on end and separated by perforated celluloid trays, the whole being retained in the barrel by front and rear perforated steel closing disks.

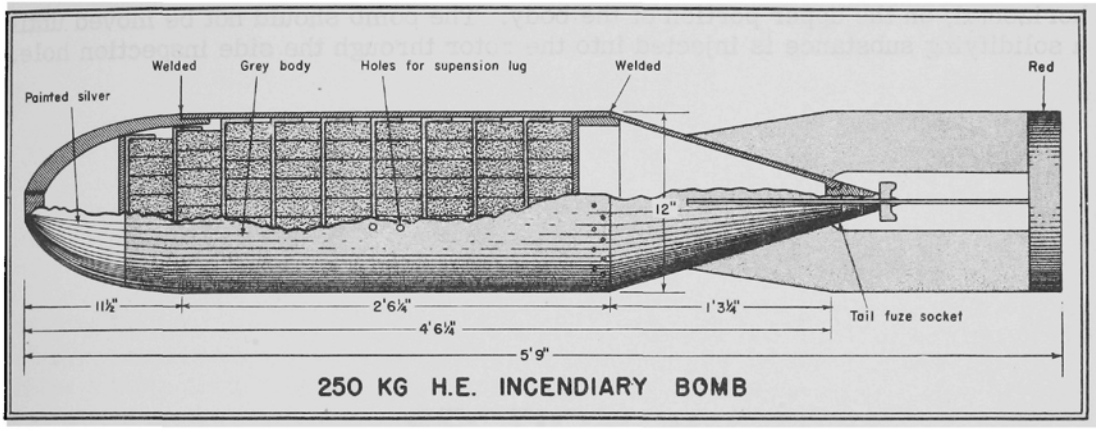
(2) The nose has a threaded opening at the front end for the fuze. The rear end is machined down to form a spigot over which the barrel is fitted and the joint welded externally. The front perforated steel closing disk fits into an internal machined recess. Two trays of cylinders extend into the nose-piece. An HE charge surrounding the gaine of the nose fuze is housed in front of the closing disk.

(3) The tail unit is made of 3/16 inch steel and is connected to the barrel by a welded cast-steel insert. A tail fuze-adaptor is welded to the apex of the cone. Four tail fins 1/16 inch in thickness with a cylindrical stablizing band and a perforated steel closing plate are welded to the sides of the cone. Four smaller subsidiary tail fins are interspaced between the normal fins and positioned closer to the barrel of the bomb.

(4) The incendiary filling consists of approximately 750 incendiary cylinders. These are pieces of 1 1/8 inch external diameter m.s. tubing of 1/8 inch wall thickness, 2 3/4 inches in length and filled with what is thought to be a mixture of rubber impregnated with phosphorus.

[redacted]

(5) A tail-fuze is screwed into the threaded adaptor welded to the tail cone. This fuze incorporates a clockwork mechanism, and is designed to achieve an air burst 150 feet to 200 feet above the ground. It has a delicately balanced



250 KG H.E. INCENDIARY BOMB

firing pin, which would respond to a slight jar in the case of an unexploded bomb. Arming vanes are incorporated in the fuze.

There is a nose-fuze which, when fitted with an instantaneous-type mechanism is thought to detonate the bomb on impact should the tail-fuze fail to function as intended.

d. Action

Normally these bombs burst at a height of 150 to 200 feet above the ground, so that presumably the tail-fuze is capable of being timed to operate in accordance with the proposed height of release of the bombs. When the tail-fuze functions as above, the HE filling detonates, bursting the bomb and showering the area beneath with incendiary cylinders.

The incendiary cylinders are propelled with great force; some have penetrated hard ground to a depth of four inches. They burn fiercely for about 65 seconds, the steel attaining a red heat and charring wood four minutes after ignition has taken place. Very few cylinders were found unburnt. Some were found as far as 176 yards from the point over which the bomb had burst.

Of four bombs released from an altitude of 20,000 to 26,000 feet, in one area, three burst at heights of 150 to 200 feet above the target, but one penetrated the ground to a depth of three inches before detonating. Apparently this bomb was one in which the tail-fuze failed to operate as intended, detonation being caused by the nose-fuze functioning on impact with the ground.

e. Disposal

Where a bomb fails to explode, the tail-fuze, of the clockwork type and

[redacted]

incorporating a delicately balanced firing pin, will most likely be in an extremely sensitive condition and readily susceptible to a slight jar or movement of the bomb.

The fuze can be identified by a graduated setting scale, 0 to 50 seconds horizontal, on the upper portion of the body. The bomb should not be moved until a solidifying substance is injected into the rotor through the side inspection hole.

SECTION II

AXIS AERIAL GAS WEAPONS

[redacted]

AXIS AERIAL GAS WEAPONS

The air weapon is new as far as gas warfare is concerned. In the event chemical warfare breaks out we can expect large scale low-altitude spray attacks with vesicants as well as concentrated bombing with vesicant and non-persistent gases.

I GERMANY

AERIAL SPRAYS

a. Spray Apparatus

(1) Nebelgerät V.200. -- This spray apparatus, suitable for use with either smoke or gas, is reported to approximate a 250 kg (550 lb) bomb in size and weight. Its capacity is stated to be 25 gallons of smoke liquid or vesicant gas. At 200 mph a strip about 660 yards in length may be contaminated during the emission period of six to seven seconds. (Note: This apparatus has previously been reported as having a capacity of 44 gallons).

(2) Nebelgerät S.300. -- A larger apparatus than the V.200, the S.300, while intended primarily for the laying of smoke screens, presumably may be used for spraying vesicant gases. It is pressure operated and consists of a cylindrical 60-gallon tank, magnetic control valves and an emission pipe. The emission is operated electrically from a switch-box near the observer's seat and can be interrupted at will. In the Dornier 217-E-1, it is carried in the bomb stowage compartment where it may be jettisoned at any time.

A German document states that a minimum altitude of 30 meters (100 feet) is necessary for cloud emission.

A number of reports mention experiments conducted at Weiner Neustadt, 30 miles south of Vienna, with gas spray apparatus installed in the Dornier 217 airplane. Other reports state that a squadron of Dorniers is equipped for gas spray and that such equipment might be installed on other types of airplanes, especially the Heinkel 111.

(3) Chema Fuma L.90 and L.190. -- Two types of gravity-operated spray apparatus, developed by the Czech firm of Chema, are available to the enemy. These may be used either for gas or smoke by a simple change of nozzles and the size chosen probably depends upon the speed of the airplane. Their general characteristics are as follows:

	Fuma L.90	Fuma L.190
Capacity	90 liters (23.8 gallons)	190 liters (50.2 gallons)
Weight empty	97 pounds	132 pounds
Weight charged (smoke liquid)	440 pounds	880 pounds

[redacted]

It is reported that about 1,000 of these spray apparatus had been produced at the time the Germans occupied Czechoslovakia, in addition, that these apparatus have previously been reported as having capacities of 20 and 42 gallons, respectively.

b. Miscellaneous

During 1941, a report from a source usually considered reliable, mentions a Messerschmitt with motors cut off, capable of gliding some 200 kilometers (124 miles) from a height of 20,000 feet. It is stated that the plane is equipped with reservoirs definitely designed to hold mustard gas. The reservoirs are equipped with spraying devices and the plane's motors are utilized to keep the mustard gas in the reservoirs under pressure.

One type of German apparatus for spraying toxic gases from aircraft is reported to hold 200 kg (440 lbs) of mustard gas. When functioned at a height of 75 to 80 feet, it contaminates a strip 2,500 feet long by 65 feet wide to an average density of 100 grams per square meter.

c. Gas Loads for Aircraft and Gliders

The following table represents an estimate of the gas loads that may be carried by German aircraft and gliders:

Aircraft	Max. disposable load (lbs)	Approx. Net Liquid gas load (lbs)	Max. still air range (miles)
Ju. 88	6,400	4,800	850
He. 111	6,200	4,600	1,400
Do. 217	6,600	4,900	1,000
Fw. 200	8,800	6,600	1,250
He. 177	15,800	11,800	1,350
Ju. 87D	4,000	3,600	estd. 375
Ju. 288	6,600	4,900	estd. 1,200
Me. 109E	550	400	550
Me. 109F	1,100	800	500
Me. 109G	1,100	800	475
Me. 110	3,300	2,500	750
Me. 210	4,400	3,300	1,350
Ju. 52	4,000	3,000	800
Ju. 90	12,000	9,000	800
Ju. 290	estd. 22,000	16,500	1,700
Me. 323	estd. 20,000 to 26,000	15,000 to 19,500	?

[redacted]

Glider			
DFS 230	2,800	2,100	) Dependent upon
Go.242	5,300	4,000	) type of tug.
Gigant	estd. 26,000	19,500	)

The above figures are unlikely to be attained in practice and indicate the maximum possible effort.

d. Description of Gliders

In view of the possible use of gliders for aerial spraying, brief descriptions of the three main types so far identified are as follows:

(1) DFS 230. -- A high-wing monoplane of conventional design, carrying a useful load of about one ton, or 10 fully equipped troops, including two pilots. A recent modification has been the installation of dual control.

(2) Go.242. -- A high-wing monoplane with the tail unit carried on two booms, the crew and freight being accommodated in a central compartment under the center section of the wing. The tail of the compartment hinges upward to facilitate loading. This glider carries a useful load of two and one half tons or 23 fully equipped troops, including two pilots.

(3) Gigant. -- This 178-foot-span glider, (see Tactical and Technical Trends No. 21, p. 1) previously known as the Merseburg, has now been identified as the "Gigant". It is a single-fuselage, high-wing monoplane with a gross wing area of about 3,200 square feet. A reliable report indicates that the fuselage has at least two decks, the upper deck floor being detachable in sections, making possible the stowage of bulky freight. The maximum useful load is about 12 tons or approximately 130 fully equipped troops. Motor vehicles or small tanks can be accommodated. The report also states that this glider has been seen towed by the twin-fuselage Heinkel.

e. Estimated Towing Ranges

By way of example, the following estimated towing ranges are given:

Glider Type	No. of Gliders Towed	Tug	No. of Tugs	Calculated Cruising Speed mph	Max. Range Miles
DFS 230	1	Ju. 52	1	110	800
DFS 230	1	Hs.126	1	120	630
Go. 242	1	Ju.52	1	108	495
Gigant	1	Ju.52	2	110	500

[redacted]

GAS BOMBS

Marked attention has been given by the Germans to aerial gas bombs. The figures given below probably indicate the size rather than the weight of the bomb. Gas bombs may be lighter than HE bombs of the same size.

(1) 10-kg (22 lb) K.C.* 10, chemical shrapnel bomb. -- This is primarily an antipersonnel bomb, in which a small amount of toxic smoke agent may be incorporated. It is similar in appearance to the S.C.** 10-kg antipersonnel bomb and probably has the same type of mechanical nose impact fuse. In addition to the chemical effect within a radius of about 22 yards from point of impact, the splinters are effective up to 45 yards.

(2) 50-kg (110 lb) K.C.50, mustard gas bomb. -- This bomb is about the same size as the S.C.50-kg HE bomb. Equipped with a highly sensitive electrical impact fuse, and an area of about 22 yards radius from point of burst is contaminated. It is provided with a small burster for ground contamination and with a larger burster for personnel effect.

(3) 250-kg (552 lb) K.C.250, mustard gas bomb. -- With a time fuse to operate when within several hundred feet of the ground, this bomb will contaminate an area of 5,000 to 6,000 square yards. It is about the same size as the S.C.250-kg HE bomb. The C250 (Flam.) incendiary bomb case may be used as the gas container.

(4) 1000-kg (2,204 lb) K.C.1000, gas bomb. -- Phosgene or other lung gasses are likely to be used in this bomb. There may be an impact fuse and small bursting charge, or the bomb may be designed to break upon impact.

II. ITALY

AERIAL SPRAYS

a. General

Reports regarding the use of vesicant gases by means of aerial sprays in the Abyssinian campaign are conflicting. There is no direct evidence that Italian land planes are equipped with spray apparatus, but captured documents describe a spray apparatus, Irroratore B, two of which are carried outside the fuselage of the seaplane Cant.Z. 501. Each tank has a capacity of 180 liters (47.5 gallons) of either mustard gas or smoke liquid, with a total emission time of 20 seconds.

b. Gas Loads for Aircraft

The following table represents an estimate of the liquid gas loads that may be carried by Italian aircraft:

*Kampfstoff Cylindrisch--thin-walled gas bomb
**Spreng Cylindrisch--thin-walled general purpose bomb

[redacted]

Aircraft	Maximum disposable load (lbs)	Net liquid* gas load (lbs)	Maximum still air range (miles)
BOMBERS			
Cant Z. 1007 bis	2,700	2,000	1,150
Fiat B.R. 20 M.	3,500	2,600	1,500
Piaggio P. 108	10,000	7,500	990
Savoia Marchetti S.M.79	2,900	2,200	1,760
S.M.84	3,500	2,600	830
S.M.82	8,200	6,100	1,250
S.M.75	3,400	2,500	1,490
FIGHTERS			
C.R. 42	250	200	530
Fiat G.50	250	200	320
Macchi 200	250	200	400
202	250	200	400
Re 2001	1,100	800	?

*Column 3 shows quantities carried with low-pressure systems, or low-pressure systems plus bombs.

The above figures represent the maximum loads of liquid gas which it would be possible to carry.

GAS BOMBS

It has been clearly established that aircraft bombs filled with mustard gas were used by the Fascists against the Abyssinians. Such bombs fitted with time fuzes to explode several hundred feet in the air, led to reports that aerial sprays were extensively employed. It is reported that in addition to the use of many 105-mm artillery shells, the Fascists dropped close to 5,000 mustard gas bombs from aircraft upon the defenseless Ethiopians.

(1) Gas-filled aircraft bombs, as shown in the following table, have been identified from captured Italian documents and other reliable sources:

[redacted]

New Designation	Old Designation	English Equivalent	Nature & Wt. of filling	Wt. of Complete Bomb	Dia. of Bomb body	Overall Length
Bomba	Bomba	Bomb	Pounds	Pounds	Inches	Inches
500 C.	C.500 T.	C.W. with Air Burst	HE ? Mustard 462.8	617.1 (or 656.8)	18.0	96.6
100 C.	C.100 P.	C. W.	HE 62.2 DA* 31.4	224.6	10.7	50.2
40 C.	C. 40 P.	C. W.	DA 14.3 HE 28.6	103.4	9.0	32.3
15 C.	C. 15 P.	C. W.	HE 7.4 DA 3.7	35.2	4.7	31.0
4 C.	Doppio Spezzone C.	C. W.	HE 1.5 DA .7	6.2 ?	2.7	12.2
2 C.	Spezzone C.	C. W.	HE .6 DA .3	3.4	2.7	6.1
	Furetto	C. W. Generator	Lacrimator 10 22.0	55	6.3	32.7

Notes:

According to a recent report these bombs are painted yellow, with a Geneva Cross indicating the filling. With the exception of the type 500 C. and the Bomba Furetto, these bombs are filled with DA.* They have a bursting charge approximately double the weight of the gas fillings and are fitted with percussion fuzes.

The 500 C. has a time fuze and a relatively small bursting charge, indicating that it is filled with blister gas and is described as a vaporizing percussion bomb.

Other than the 500 C., the weights of these bombs roughly correspond with their nomenclature. No doubt the 500 C. is so named because it has the same external dimensions as the 500-kg (110 lb) HE bomb and would fit the same bomb racks. Naturally, a gas-filled bomb of the same dimensions, having a thinner metal case, would be considerably lighter in weight.

(2) Aerial Gas (or Incendiary) Container. -- Among Italian chemical warfare material captured near Tripoli a number of sheet metal cylindrical

*Diphenylchlorarsine

containers 5 feet in length and 10 1/2 inches in diameter were found. They are painted a battleship gray, with a 1 3/4 inch yellow band circling the center of the body, and weigh approximately 60 pounds, empty.

The body of the container has eight chambers, each 2 1/4 inches in diameter and 28 inches long. The tail end of each chamber is sealed and fitted with a spring platform. The nose-end is fitted with a detachable steel plate covering the end of all eight chambers, and is held in position by a release pin connected with a wire cable running through the center of the container. The nose proper consists of an aluminum dome, which is a push-fit onto the body, held by means of four spring clips.

An ingenious retarding device, attached to the tail, is operated by a clockwork mechanism calibrated from 0 to 20 seconds. On release of the container from the aircraft, the retarding device functions at the time set. Simultaneously, the release pin holding the guard plate is removed by means of the attached wire cable connected to the clockwork mechanism. Due to the sudden decrease in the rate of fall, the contents of the inner tubes (gas or incendiary bombs) are forced down, with the assistance of the spring platforms in the tubes, and overcome the four spring clips by which the nose is attached. The nose and guard plate thereby fall away allowing the bombs to scatter.

No bombs to fit the container were found, but since it is similar in design to the Italian incendiary container used in Caproni aircraft, it is logical to assume that the container was designed for gas or incendiary bombs.

III. JAPAN

AERIAL SPRAYS

Other than an aircraft spray spread from leak-proof tanks behind the engine cowl, there has been no definite information regarding the design, capacity, or chargings of spray apparatus in use. It is probable that here the Japanese, as in other chemical warfare matters, duplicate German apparatus.

Gas Loads and Ranges

The following table represents an estimate of the maximum gas loads that may be carried on the most likely types of aircraft at present in use by the Japanese Air Force:

[redacted]

AIRCRAFT	Max. disposable load (lbs)	Net liquid gas load (lbs)	Max. still air range (miles)
Army Twin-engine Bombers			
97 T.E. Bomber (Mitsubishi)	4,400	3,300	670
99 T.E. Bomber (Kawasaki ?)	2,200	1,650	630
00 T.E. Recco-Fighter (?)	1,100	830	1,275
Army Single-engine Bombers and Recco's	A V E R A G E		
98 Light Bomber-Recco (Kawasaki)			
97 " " " (Mitsubishi)	660	500	600 to 700
98 " " " (Mitsubishi)			
99 Ground Attack Recco (?)			
Navy Twin-engine Bombers			
96 T.E. Shore-Based Bomber (Mitsubishi)	2,200	1,650	1,710
01 T.E. Shore-Based Bomber (Mitsubishi)	3,300	2,500	1,660
Navy Single-engine Deck-landing Bombers			
97 Torpedo-Bomber (Mitsubishi & Nakajima)	1,760	1,300	645
99 Dive-Bomber (Aichi)	1,000	750	830

Army and Navy single-seater fighters and single-engined seaplanes are not included, as in these cases the gas load is unlikely to exceed 200 pounds.

GAS BOMBS

(1) 50-kg Gas Bomb, Type 92. -- During early operations in China the Japanese used a 50-kg (110 lb) gas bomb, filled with a mixture of equal parts by weight of mustard gas and Lewisite. The chemical filling weighs 23 kilos (50.6 lbs). This is reported to be their chief chemical bomb.

The bomb is grayish green in color with a red and blue band at the nose. There are two yellow bands at opposite ends of the body with a white band in the center.

The bomb consists of a steel nose, cylindrical casing and tail assembly, with an overall length of 45 inches. The steel body has a wall thickness of 3/16 inch and is 26.4 inches long by 7.5 inches in diameter. A cast steel nose is attached to the body by three 1/4 inch grub screws and the sheet iron tail assembly, consisting

of four vanes welded to the tail cone, with two sets of box-type struts, is welded to the body.

On impact, the nose-fuse functions and the flash from the detonator cap ignites the first detonator to initiate the picric acid pellet. The main filling in the bomb nose then detonates to shear the grub screws and eject the body of the bomb from the shaft of entry. At the same time, the second striker is forced upwards to overcome the creep spring and to pierce and ignite the second detonator, which in turn ignites the booster charge. The detonation of the picric acid is then initiated in the exploder pocket, fracturing the bomb and spreading the blister gas.

(2) Miscellaneous Gas Bombs. -- Details of a 15-kg (33 lb) combination HE/toxic smoke bomb, possibly of the nose-gas variety, are also reported. The construction and operation of this bomb is similar to that of the 50-kg (110 lb) gas bomb.

A French report (July 1939) mentions 25, 50, 100 and 200-kg gas bombs filled with mustard gas, Lewisite, phosgene and diphosgene.

[redacted]

CORRECTIONS

AIR

No. 35 p.2: The illustration of the Savoia Marchetti S.M. 82 "Canguru" airplane was incorrectly captioned as a bomber. In fact, as set forth in the accompanying article, it is one of the best known Italian transport planes.